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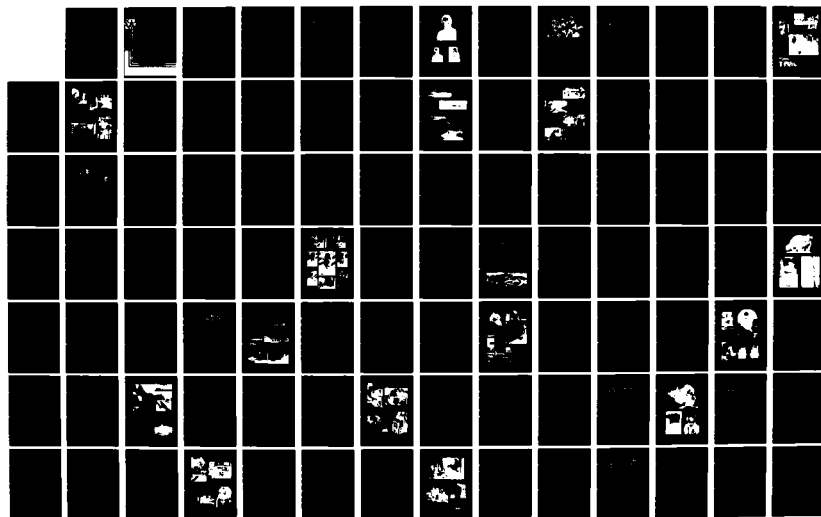
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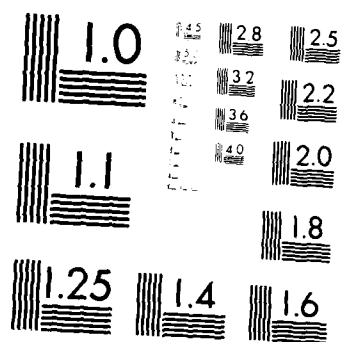
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**US ARMY AEROMEDICAL RESEARCH LABORATORY
ANNUAL PROGRESS REPORT, FY 1982**

(1 October 1981 - 30 September 1982)

Reported By:

**Dudley R. Price, Colonel, MC, SFS
Commander**

ADA 129854

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October 1982

**U.S. ARMY AEROMEDICAL RESEARCH LABORATORY
FORT RUCKER, ALABAMA 36362**

USARL

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20. ABSTRACT

The annual progress report gives the FY 82 personnel and funding strength of the US Army Aeromedical Research Laboratory. It outlines the ten scientific programs being pursued by the laboratory. Those programs are: visual and auditory impact physiology; auditory effects of blast overpressure; noise hazards of combat vehicles; impact biodynamics of crashworthiness and personnel armor; vibration hazards of combat vehicles; crew life support systems biotechnology; sensory limitations and man/machine systems; biomedical aspects of crew workload, selection, and staffing; anthropometry and ergonomics: criteria for Army aviators; and antidote and antidote/agent effects on the visual system.

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Mission Statement

Conducts research and development on health hazards of Army aviation, tactical combat vehicles, and selected weapon systems. Assesses the health hazards from noise, vibration, acceleration impact, and visual demands of such systems, and defines measures to offset hazards. Assesses stress and fatigue in personnel operating these systems and develops countermeasures. Assists in development of criteria upon which to base standards for entry and retention in Army aviation specialties. Assists other US Army Medical Research and Development Command (USAMRDC) laboratories and institutes in research on the bioeffects of laser systems, medical defense against chemical agents, impact of continuous operations on individual and crew performance, and development of improved means of patient evacuation. Assesses current life support equipment to identify causes of failure and devise improved design. Assists the combat developers and materiel developers of new Army aviation and tactical combat vehicle systems to recognize and eliminate health hazards as early as possible in the developmental cycle. Conducts collaborative research with other Department of Defense and other Federal agencies on medical research and development issues of common concern.

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COL DUDLEY R. PRICE, COMMANDER



LTC Roger W. Wiley,
Deputy Commander



LTC Roger P. Hula,
Executive Officer

Introduction

Research efforts at the US Army Aeromedical Research Laboratory (USAARL) have two objectives: enhancement of the individual soldier's combat performance and efficiency, and the prevention of injury or death in the operational environment.

The USAARL was established by Department of the Army General Order 59 on 1 Jul 62, and was implemented by Office of The Surgeon General General Order 42 on 4 Oct 62 to accomplish research in support of the Army aviation community and airborne activities and to provide a central aeromedical research and reference library for the Army aviation effort. Additional mission areas were added to the laboratory in 1974. The laboratory's further expanded mission now includes the assessment of the medical impact of advanced armor and artillery weapons systems and other nonmedical materiel.

USAARL is one of nine medical research laboratories of the US Army Medical Research and Development Command (USAMRDC), Office of The Surgeon General, and is a tenant organization located at the US Army Aviation Center (USAAVNC), Fort Rucker, AL. It is the only medical laboratory designated to deal with Army aviation's unique occupational problems.

Nineteen hundred eighty-two marked a milestone in USAARL's history with the celebration of its 20th Anniversary. In 20 years the laboratory has grown from one building and seven personnel to a large, modern facility with 152 people. Our growth has been in research, people, and facilities, and we're proud of them all.

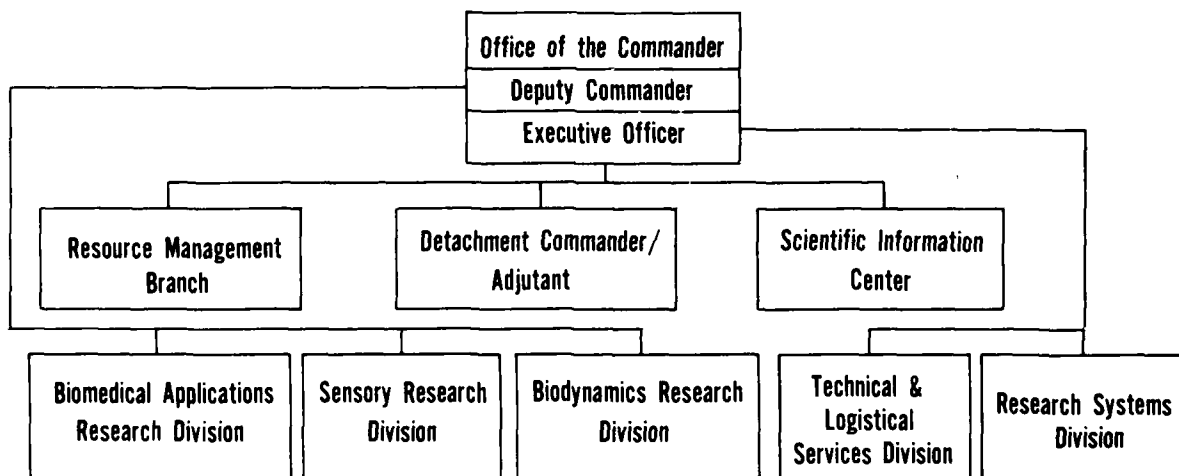
Under the direction and guidance of the USAMRDC, USAARL moves with the sure steps of maturity and responsibility of a firmly established research organization into the 1980s. The mission remains, through research, to preserve and enhance the health, safety, combat effectiveness, and survivability of the soldier.

This report gives an overview of USAARL during FY 82, identifies current areas of research, and gives a brief description of the research programs. The DD Forms 1498 under which this research work is accomplished are in the Appendix.

This report is prepared to fulfill the requirements of OTSG Regulation 7-51.



UNITED STATES ARMY AEROMEDICAL RESEARCH LABORATORY ORGANIZATIONAL CHART



Management

The beginning of FY 82 was highlighted by the long-awaited move to the new 116,620-square-foot research structure. This transition took place in October 1981 with a ribbon-cutting ceremony in November 1981. Personnel enthusiasm accounted for completion of the move in record time.

Management decisions during the year were driven mostly by resource constraints from several sources, but successful defense of mission requirements netted sufficient monetary and personnel resources to accomplish essential elements of the mission. Principal constraints were caused by inability to expend available resources due to untimely Congressional appropriation and inflation, which caused a 90 percent increase in overall utilities costs. Our lack of authority to fully obligate available funds resulted in research program delays and undue internal reprogramming of resources. Momentum which was lost in several program areas was not regained until late in the fiscal year and was hampered again by long lead times for equipment procurement. Significant management issues were caused by personnel recruitment and hiring actions. In the job series of biological laboratory technician and research physicist, hiring delays in excess of one year were experienced.

Difficulties were overshadowed by successes in research programs and in management of facilities and resources. New management initiatives included participation in technology transfer action associated with the Stevenson-Wydler Technology Innovation Act of 1980, establishment of the USAARL Junior Fellowship Program, and several firsts in the areas of personnel management and equal employment opportunity.

The following significant events took place in FY 82:

1. Oct 81. Approval of new mission statement and organization structure. Of significance was the adoption of two additional new missions: participation in the Research Area live mission in medical defense against chemical agents, and beginning an advanced development mission in improved means of patient evacuation.

26 Oct 82. Building 6201 of the new research laboratory was accepted, and the one-year warranty period began.

1 Nov 82. Ribbon-cutting ceremony for USAARI. Attending the ceremony were the Honorable William L. Pickins, Representative for the Second District of Alabama; MG Garrison Rappund, Assistant Surgeon General for Research and Development, and Commander, USAMRDC; and LT Richard D. Kenyon, Deputy Commander, USAVNC and Fort Rucker.

12 Jan 82. Command walk-through of the new laboratory, signifying completion of relocation of personnel and equipment and commencement of normal operations.

8 Feb 82. Technical Program Review. This technical review consisted of an overview of USAARI's research programs to include recent completions, ongoing projects, and projects planned for the immediate future. Attendees included representatives from the US Army Health Services Command (HSC), USAMRDC, US Army Academy of Health Sciences (AHS), USAVNC and tenant organizations, as well as the USAARI consultants.

8-12 Feb 82. Manpower Survey conducted by USAMRDC which resulted in validation of 13 additional manpower requirements and allocation of eight new manpower authorizations.

15-25 Mar 82. Internal Review conducted by USAMRDC.

18-19 Mar 82. Commanders' Conference, Fort Detrick, Frederick, MD.

5-5 Jun 82. Open House to celebrate the 20th anniversary of USAARI and the 40th anniversary of Army aviation.

15-18 Jun 82. Maintenance Assistance and Instruction Team (MAIT) visit by USAMRDC.

2 Jul 82. Change of Command. COL Dudley R. Price became USAARI's new commander, replacing COL Stanley C. Knapp.

12-15 Jul 82. Command Supply Inspection by USAMRDC.

Our new research facility has attracted a multitude of distinguished visitors. In addition to the more than three thousand visitors, we were visited by the US Army Audit Agency (AAA), twice on official business and once for an informational briefing for the Auditor General. Other distinguished visitors included the Chief of Staff of the Army, the Sergeant Major of the Army, the Deputy Surgeon General, the Commandant of the AHS, the Commander of BSC, an Under Secretary of the Army, and, finally, the Assistant Secretary of the Army for Research, Development, and Acquisition.

Technology Transfer

Steps were taken in FY 82 to implement the provisions of the Stevenson-Wydler Technology Act of 1980 (PL 96-480). USAARL became a member of the Federal Laboratory Consortium (FLC), and an Office of Research and Technology Applications (ORTA) was established. A representative was sent to the spring meeting of the FLC. The Scientific Information Center was the focal point for requests for information from the public and private sector. More than 50 requests were received for copies of reports and bibliographies. Six scientific seminars were given in FY 82 for the purpose of interfacing with the academic environment and exchanging ideas related to research. USAARL is performing. These seminars were heavily publicized and attendance varied from 50 to 50 people including staff from local hospitals, attorneys and teaching staff at local universities.



Support Divisions

Headquarters

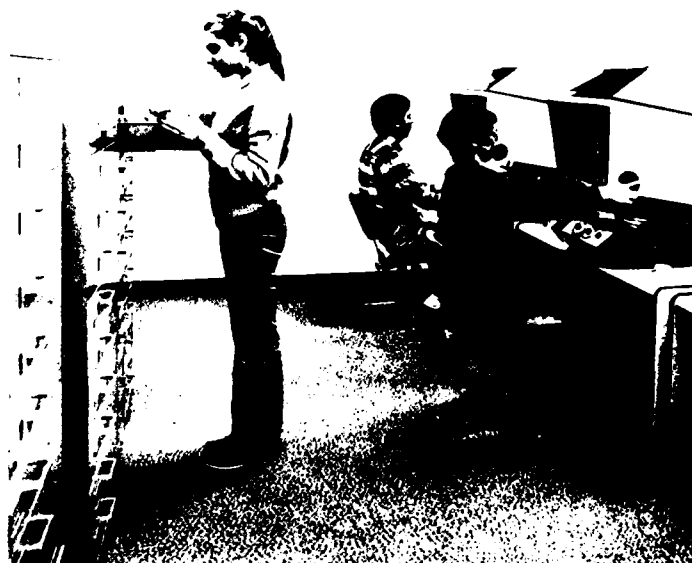
The headquarters group, in addition to the Commander, Deputy Commander, and Executive Officer, consists of the office of the Adjutant/Detachment Commander, the Scientific Information Center, and the Resource Management Branch.

Office of Adjutant / Detachment Commander

The office of the Adjutant/Detachment Commander provides command and control over all enlisted personnel to include personnel actions, disciplinary actions, billeting, and training. This office also coordinates and supervises the administrative functions and related office service operations of the USAARI headquarters.

Protocol affairs regarding visitors from lateral and higher headquarters are supervised and coordinated by the Adjutant/Detachment Commander's office. During FY 82, over 5,000 visits were made by personnel to the laboratory. Included in this group were 85 distinguished visitors with eight foreign nations being represented. This office also coordinated the Ribbon Cutting Ceremony on 6 Nov 81, the 20th Anniversary Celebration on 3-4 Jun 82, and the Change of Command Ceremony on 2 Jul 82.

Other services provided were classified document safeguarding and postal support for the organization, as well as support for the laboratory's research flight requirements.



Resource Management Branch

The Resource Management Branch provides services in fiscal and manpower management, civilian personnel administration, and other management programs for the laboratory.

During FY 82, a USARMC manpower survey, which validated a recent laboratory reorganization and recognized 15 additional manpower spaces, was completed. The proposed Table of Distribution and Allowances (TDA) has been submitted to the Office of the Surgeon General for approval.

Significant progress was made in the area of equipment acquisition and modernization. Monetary savings resulting from the delay in the move to the new laboratory facility were used to replace and modernize laboratory equipment. An unfinanced requirement of \$246,000 in FY 81 for new acquisition and replacement equipment was reduced to \$516,000 by the end of FY 82.

A USARMC-sponsored Internal Review Audit was conducted in FY 82, and found no discrepancies or regulatory violations within the Resource Management Branch.

Scientific Information Center

The Scientific Information Center is the centralized scientific information and reference center for the Army aviation community concerning aeromedical and life sciences research. Additional responsibilities added during FY 82 included directing USAARL's Cooperative Education Program and assuming responsibility for technology transfer as mandated by the Stevenson-Wydler Technology Innovation Act of 1980. The Scientific Information Center also arranged and publicized scientific seminars held at USAARL during the year.

The Writer-Editor's office continued to provide technical editing and writing, public and command information coordination, exhibit support, and laboratory historical research. Twenty-nine Hometown News Releases were submitted during FY 82, and eight articles were published highlighting the laboratory's achievements and personnel. Special publications this past year included "USAARL in Review" and an abbreviated history of USAARL which was prepared for the Change of Command Ceremony. The production of a videotape entitled "USAARL Is . . ." was completed for use as an orientation or briefing on USAARL. A historical pictorial exhibit was completed and is displayed in the foyer of the new facility.

During the past year, USAARL became an active participant in USAMRDC's electronic mail system, MAILBX. Additionally, an on-line data base system, DIALOG, became operational. Scientific Information Center personnel were trained in the system's basic and advanced applications, and special courses on Medline and Excerpta Medica data bases were given to the librarians. Forty-six literature searches were done using this system. Plans were made for a dedicated telephone line and a data phone to enhance the system's effectiveness.

The physical move to the new facility dominated the year's work efforts. A total of 65,000 items were moved; new shelving was installed; and old shelving was moved and reinstalled. Seven units of compact shelving were installed in the vault.

New additions to the Scientific Information Center's staff were a Junior Fellowship student and two temporary part-time workers--a library technician and an editorial assistant.

Research Systems Division

The Research Systems Division provides laboratory-wide support in the areas of biomedical engineering, data systems and instrumentation, computer services, aviation, veterinary medicine, and mathematical and statistical services. FY 82 was a period of growth in all areas of support for the laboratory, much of which was directly related to the move to the new facilities.

Biomedical Engineering Branch

Major accomplishments by this branch during FY 82 were as follows.

(1) A circuit was designed and developed to reduce the motion artifact encountered during in-flight measurements of pilots' ECG recordings.

(2) Instrumentation support (consultation, design, analysis, and verification) was provided for a multi-faceted study of assessment of strength requirements of Army aviators.

(3) Circuitry was designed and developed for use in a pilot workload study which utilized the helicopter operational trainer simulator.

(4) A network was provided to connect remote terminals to the Systems Engineering Labs (SEL) 85 computer. Existing circuitry was modified to establish a high-speed parallel interface between an LSI-11 computer and the SEL.

(5) A system was developed for the AH-21G aircraft to monitor the parameters of airspeed, barometric altitude, radar altitude, rate of climb, heading, pitch, roll, pilot control positions, landing gear and flap positions, engine torques, flight loads and slip. The procurement and installation of all equipment was coordinated by the Biomedical Engineering Branch.

(6) Improvements were made to increase the reliability of the Helicopter In-Flight Monitoring System (HIMS) II. An evaluation was initiated to determine its overall accuracy, and modifications were designed to allow use of the HIMS II in both the AH-21G and AH-1H aircraft.

(7) Equipment was designed and fabricated and instrumentation was set up to record dummy and human responses in simulated tank firing studies conducted at the U. S. Army Tank-Automotive Command. Studies were conducted to verify the simulator's performance in duplicating actual tank firing measurements.

(8) Improvements were made to the circuitry for the Chemical Defense Study to measure body skin temperatures of pilot/subjects.

(9) Circuitry was designed to expand the interface to encompass the second phase of testing of the Micro-Heads-Up Display. It now has the capability to function in the helicopter operational trainer simulator and the AH-1H aircraft.

Data Systems and Instrumentation Branch

The FY 82 work effort was laboratory-wide in scope and supported not only ongoing research programs, but also devoted a large amount of time to the preparation of instruments and equipment for research studies.

The Multi-Axis Vibration System (MAVS) was used primarily in the support of two studies: (1) the effect of vibration and posture on the incidence of back discomfort in Army aviators which was conducted by the Biodynamics Research Division, and (2) effects of vibration on visual acuity which was conducted by the Sensory Research Division. Also, during the year the building housing the MAVS was completely insulated to provide better temperature control in future studies.

Preparations were completed for a study to be conducted by the Biodynamics Research Division. This study, entitled "The Anthropometric

Criteria for Army Aviators," will use the MAVS and various other in-house designed and fabricated machines and instrumented data generated and recording systems. Some of these systems include: (1) an audiovisual feedback system for foot position on the foot-tracking apparatus; (2) a system to provide cumulative time on target and number of transitions across target in each of four separate quadrants for the arm-tracking apparatus; and (3) an exertion prompter to alert the subjects to the time for various exertion rates.

Preparation of the USAARL flight simulator was begun for the testing of the Aviator Night Vision Intensifying System (ANVIS) and the Micro-Heads-Up Display (Micro-HUD).

A control console was assembled for use at the Highfalls research facility. This console contains a VHF and tactical FM receiver and transmitter for aircraft communication, a wind speed and direction indicating and recording system, a radio-activated strobe light system, and power supplies for console operation.

Other instrumentation support included the design and fabrication of a control circuit for use in a blue-green light study (operation and adaptation study of red versus blue aircraft cockpit lighting).

In conjunction with the Biomedical Engineering Branch, a cable system was fabricated and installed between the hybrid computer and remote data terminals throughout the laboratory. A cable harness and junction box were also fabricated for adaptation of the HIMS II to the JU-21G aircraft.

Technical consultation was provided to the Fort Rucker Office of Civilian Personnel in the evaluation of electronic technicians.

Modeling and Simulation Branch

With the move to the new USAARL facility, the operating system of the hybrid computer was reconfigured to better meet the needs of an expanding laboratory. These changes were made to take full advantage of all available hardware and the centralized location of the main computer in the new facility. New systems software modules also were developed to provide smooth operation for laboratory users at remote interactive terminals while providing full systems and file security. The capacity for these terminals was increased to 27 from 15 with 17 lines currently active.

The hybrid computer facility was upgraded by the acquisition of a second SEL 85 computer and peripherals through the reutilization program. This system will begin operation in November 1982, and will provide a sixfold increase in mass storage capacity, a threefold increase in tape speed, and doubles the number of tape drives.

Digital and interactive applications can now be operated on one computer while hybrid operations and software development are performed on the other. This separation will provide a more efficient allocation of resources, greatly increased reliability, quicker response, and increased production.

During the past year, eight systems utility programs were developed so that the automatic data processing (ADP) personnel and knowledgeable users could better use the hybrid system for software development and documentation. Through these programs, the following capabilities were added:

- (1) Full system search for a variable-length character string. This makes it possible to find all references to old projects, handy subroutines that have been previously written, or for compiling systems reports.

- (2) Dynamic activation of often-used programs. This increases production by making it faster and easier to activate certain system programs in the main computer room.

- (3) Documentation assistance. To assist in the documentation process, programs now are available to produce a glossary of variables, FORTRAN variable cross reference, and an enhanced catalog map for the creation of efficient overlays. Another program automatically keeps records of security operations and file editing activity.

- (4) Disk file maintenance. A new program now is used for file creation which automatically maintains a raster directory of new files and a description of their contents.

During the past year, 54 application programs either were developed or underwent major revision. These fall into the following categories:

- (1) An interactive graphics program which is flexible enough to be quickly interfaced to virtually any data set and provides capabilities for graphing, transforming, summarizing, listing, searching, partitioning, and performing regression analysis.

- (2) A collection of five programs which provide the means for users to enter card-image data, batch job specifications, or program source code using an interactive CRT terminal.

- (3) A system of four programs which support research using the OH-1 helicopter simulator. These programs provide for data acquisition, on-line monitoring of aircraft and subject's status, on-line and off-line graphics of time-series data, and summary statistics of selected segments of time-series data.

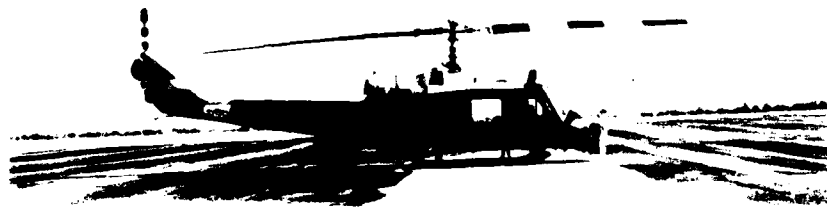
- (4) A system of three hybrid programs which support research on the vehicular firing of artillery and its effect on human and dummy subjects. These programs provide for signal conditioning, data



JU-21G



JUH-1H



JUH-1M

JOH-58A



acquisition, graphics, and compatible tape output for collaborative analysis with another agency.

(5) A system of five hybrid programs which support the anthropometric research project currently being conducted by the Biodynamics Research Division. These programs provide for the acquisition, reduction, and storage of data from two laboratory test devices for measuring a subject's arm and leg strength under a variety of conditions. One of the devices is used in conjunction with the USAARL Multi-axis Vibration System. Data from these measurements are acquired from analog tape and stored digitally for analysis and graphical exploration using other programs.

(6) A system of six programs taken from the book FOURIER ANALYSIS OF TIME SERIES by Dr. Peter Bloomfield was adapted for operation on the USAARL hybrid computer. These programs provide the capabilities for:

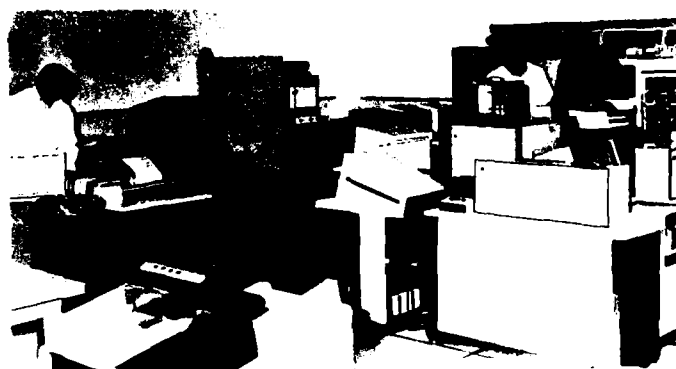
- Cross-periodogram smoothing
- Impulse response function computation
- Periodogram smoothing
- Digital data demodulation and filtering
- Fourier transform and periodogram computation
- Hidden periodicities modeling

(7) HIMS II. A system of ten computer programs was devised for computers which support research using the UH-1 helicopter. An LSI-11 computer is used for all airborne operations; a PDP-11/85 computer is used for laboratory processing of cartridge data tapes; and the hybrid computer is used for graphics, printout, and statistical analysis. These ten programs provide the following capabilities:

- Airborne data acquisition and storage on tape
- Transmit tape data to hybrid computer
- Print time-series data
- Graph time-series data
- Selection of time segments for analysis
- Specification and storage of parameters for the study
- Generate summary statistics for time segments
- Display summary statistics
- Transmit summary statistics to hybrid computer
- Print summary statistics
- Graph summary statistics

Aviation Branch

During FY 82 research support flights were provided that included flights at 15,000 feet in support of On-Board Oxygen Generated System (OBOGS) studies, night flights using modified night vision goggles,



and flights in support of blue-green instrument lighting. Work also continued on the cockpit anthropometric study.

Ground school and flight training were provided for two newly-assigned aviators. Research and training missions were conducted in the JUH-1H, JU-21G and JOH-58A aircraft. The JUH-1M aircraft is awaiting turn-in since it is no longer needed for research studies.

A Flying Hour Management computer program was instituted during FY 82. The program, which may be accessed by members of the laboratory (i.e., Resource Management Branch), provides accurate and near real-time aviation data. It tracks flying hours (both research--by project, and training), computes actual cost per flight hour, reports by exception when aircraft is 10 hours before scheduled maintenance (to assist in scheduling), and provides analysis and projections of flying hours and costs. It also provides the ability to project peak flying months for research and training and for scheduling aircraft maintenance to avoid conflicts. As more months of data are stored, this program will become increasingly valuable as a management tool for using our aviation assets more efficiently.

Veterinary Medicine Branch

FY 82 was a year of change with the move to the new facility in fall 1981, and then the expansion into the Annex in January 1982. Much of the branch's efforts for the year consisted of purchasing and placing new equipment, and debugging and stabilization of the animal rooms and related equipment.

A production colony of *Galago crassicaudatus* (Bush babies) was established with three live births during the year. The production colony of chinchillas was reestablished in the new facilities with an increased number of live births. In addition, the branch procured and is maintaining cats for use by the Sensory Research Division's Neurosciences Research Group.

During the year the animal facility underwent an inspection by the American Association for Accreditation of Laboratory Animal Care (AAALAC) and was granted continued full accreditation with no discrepancies.

Statistical/ Mathematical Support

A wide variety of statistical/mathematical support was provided for ongoing research studies. This support resulted in the following reports: "Statistical Evaluation of Respiratory Gases O_2 and CO_2 Data Obtained Via a MGR-1100 Machine (Perkin-Elmer) at Two Different Altitudes;" "Table of Random Digits;" "Sample Surveys--Principal Steps in Sample Survey;" "Pursuit Rotor Tracking Performance in Conjunction with Extended Flight Operations in a Helicopter Simulator," (a joint report with the Biomedical Applications Research Division); and "Statistical Interim Report: Statistical Comparison of Vibration Regimen Between a Standard and a German Helicopter Seat for Humans," (a joint report with the Biodynamics Research Division).

During the year considerable effort was devoted to four projects: (1) the statistical aspects of a sample survey to assess the extent of hearing loss in U. S. Army aviators at Fort Rucker; (2) review of the protocol entitled "Anthropometric Criteria for Army aviators;" (3) considerations of experimental designs for the study of neck muscle stress in aviators; and (4) a study to determine the user needs, source, and cost of up-to-date statistical computer packages required for the laboratory. While the desired statistical packages (BMDP, SPSS and SAS) and the most desirable source (National Institute of Health contract) were determined, the contract for services has not been written.

Statistical/mathematical advice or consultation also was provided or analysis performed for the following studies: cardiopulmonary function test in a vibration environment; the effects of whole-body random vibration on visual performance as a function of observer ocular characteristics; convolution of integrals and matrices arising in connection with an investigation of the physiology of an animal eye; the mathematics of translation and rotation of axes in connection with a study of helicopter seat crashworthiness; a sample survey of bifocal vision in Army aviators; and discussion of "error rates" in experimental design context.

Technical and Logistical Services Division

Technical and Logistical Services Division (T&LS) played a significant role in the laboratory's move to its new facility. It was responsible for coordinating the move by planning and physically moving all the other activities of the laboratory. This was accomplished through cooperation from all enlisted personnel assigned to USAARL and through the supervision of the Supply NCIC and the Property Management Officer.

The matrix for the new telephone system was coordinated with the U. S. Army Communications Center, and the installation of all class A telephones with intercom systems was completed. As a result of the new system, there is a considerable savings of time and efficiency in USAARL's telephone operations.

The T&LS Division continued to provide total support to the Laboratory through scientific arts, laboratory crafts, maintenance management, supply and acquisition, property management, and facilities management areas. At the end of the fiscal year, the division underwent a major reorganization which resulted in the consolidation of the Property Management Branch and the Supply Branch into a logistical Services Branch and in the consolidation of the Scientific Arts Branch and the Laboratory Crafts Branch into a technical Services Branch. While this new organization represents some streamlining of management and control of operations, it is business as usual as far as customer relations are concerned.

Office of the Building Engineer

During FY 82, the Director, T&LS Division, successfully negotiated a custodial and maintenance services contract for servicing the new research facilities. This is a "first ever" type service arrangement at Fort Rucker and is serving the new facility quite effectively. The maintenance and custodial contractors are under the technical supervision of the Building Engineer, a new USAARL employee who also functions as the Fort Rucker Contracting Officer's Technical Representative (COTR). It is significant that the building engineer successfully monitored the correction of over 5,000 deficiencies in building construction. Another major effort included monitoring and documenting warranty requirements for installed equipment and building facilities.

Property Management Branch

Ending FY 82, the value of the property book was \$10,475,500. This included 2,236 lines with 4,674 items. During the year command emphasis on property accountability was greatly stressed. The Commander placed special emphasis by designating senior officers and civilians as hand receipt holders, personally directing inventories and conducting walk-through inspections.

A command supply inspection of USAARL revealed that the property book data base was in excellent condition with 100 percent accuracy of

recordkeeping and property accountability. This was made possible through the easy identification and inventory of equipment due to correct information of manufacturer, model, and serial number; complete and up-to-date hand receipt files; and making all hand receipt holders aware of their responsibility for safeguarding Government property, proper procedures for accounting for their property, and location of their equipment.

Laboratory Crafts Branch

During this period the Laboratory Crafts Branch placed its new shop in operation at the new facility. Shop personnel moved their shop supplies and equipment which were not covered by a contract move and also assisted with the moving of the other divisions. Despite this major interruption of their work effort, the Laboratory Crafts Branch was able to complete 274 work orders during FY 82. The time expended per work order ranged from .5 man-hours to 56 man-hours.

Scientific Arts Branch

The Scientific Arts Branch, consisting of illustration, drafting, and still and motion picture photography, moved into a comfortable and well-equipped area in the new USAARL facility. The installation of new automatic photographic processing equipment greatly increased the efficiency of the branch. Work was begun on a data base for rapid retrieval of scientific arts data for reprint, duplication, or modification. Audiovisual support for mission essential research was provided on a quality and timely basis throughout the year.

In Mar 82, this branch reached the highest output of work orders ever completed for a one-month period, 102 work orders. With average personnel strength at 5.9, it produced 16,924 units of still photo work; 1,109 units of graphic arts; and 4,200 feet of motion picture footage to complete a total of 708 work orders during the fiscal year.

Supply Branch

A total of 5,868 purchase requests were requisitioned during FY 82. The large influx of line items ordered during the year was due to replacement items that were used and not replaced.

because of the move to the new building. After the transfer, researchers had to resupply the necessary items to accomplish their mission. Purchase requests for FY 83 are not expected to be as high as FY 82 and FY 81 because of the move and restocking of items.

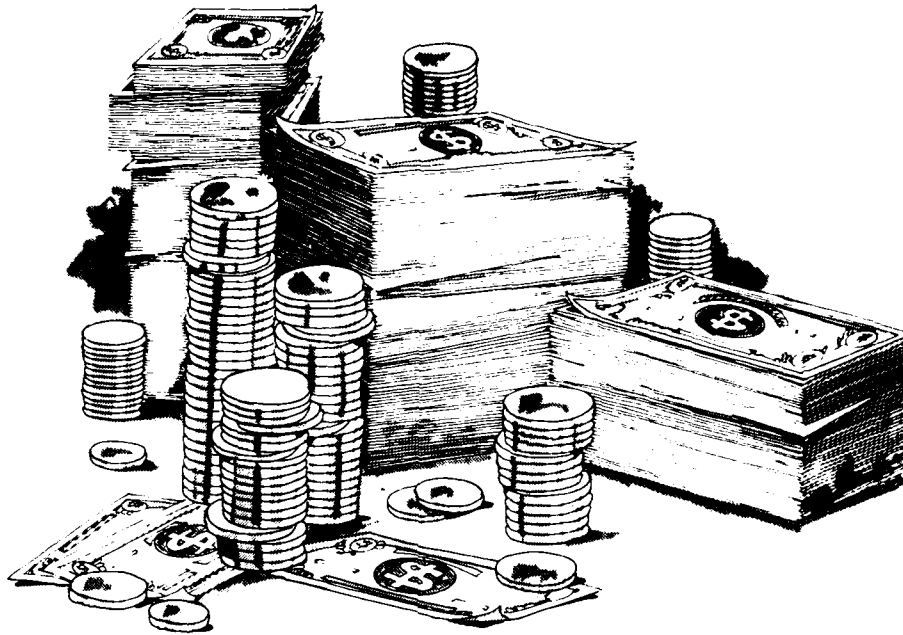
During FY 82, the Supply Branch received a satisfactory overall rating from the command supply inspection conducted by the U. S. Army Medical Research and Development Command's logistics team.

Maintenance Branch

The Maintenance Branch received 5,904 scheduled work requests and 415 unscheduled work requests during FY 82. The increases over FY 81 stemmed from the new equipment acquisitions, the continuing maintenance of laboratory equipment already in place, as well as additional requirements placed on the branch at the order of its division director. Preventive maintenance services provided to the laboratory during the year totaled 5,927. This included 4,929 work requests at 5,557 man-hours; 937 work requests from installation support at 1,159 man-hours; and 61 work requests of commercial contract/depot maintenance at 248 man-hours.

The Maintenance Branch was fully automated to the Army Medical Department Property Accounting System (AMEDDPAS) 05 during FY 82. In addition to implementing this accounting system, the Maintenance Branch handled all Test, Measurement, and Diagnostic (TMDE) calibration services for the laboratory.

A Maintenance Assistance and Instruction Team (MAIT) visit attributed some operational problems found in the branch to be due to understaffing. During the year, a manpower survey recognized five requirements for the Maintenance Branch. It now has four authorizations and only three personnel assigned. During FY 82, the Maintenance Branch lost four personnel: two temporary TAMS/Parts Clerks and two repair technicians. It gained one permanent TAMS/Parts Clerk due to the authorization of a temporary position and replaced one of the repair technicians.



PROGRAM FUNDING FY 80-81-82
(Thousands of Dollars)

FY Year	6.1 Research	6.2 Development	6.5 Management Support	Reimbursable	Total
80	421.1	2120.2	110.8	467.8	3119.9
81	713.0	2607.0	49.0	615.0	3984.0
82	850.0	3985.0	181.0	283.7	5299.7

Funding

Customer-Funded Projects

Customer-funded research projects are complementary to our established scientific research programs. Each research laboratory has specific research expertise that can be utilized by designers and developers that do not possess the manpower or expertise to accomplish the research. USAARL performs the research, accumulates the data, and prepares the written report. This allows us to increase our scientific data base and to supply the information needed by the designers and developers.

There were nine customer-funded projects in FY 82, three carried forward from FY 81, and six new ones. Two of those from FY 81 were completed in FY 82. The projects, funding agency, and a brief progress report are given.

Title Aviator Workload/Performance Assessment in Support of Advanced Attack Helicopter (AAH)

FUNDED BY: AAH-64 Project Manager, Aviation Research and Development Command (AVRADCOM)

INVESTIGATOR: CPT David O. Cote

Objective To investigate the physiological and psychological limits of human capability and compatibility with aviator crew stations, crew tasking, and consequent cumulative crew workload, stress, and fatigue in the YAH-64 and provide data which will point out areas of system design hampering mission effectiveness. To organize and assess aviator performance data with which to determine the navigation performance and procedures for AAH crewmembers.

Progress Project was completed and results have been published in USAARL Report 82-8.

Title Aircrew Integrated Helmet Support

FUNDED BY: Aviation Research and Development Command
 (AVRADCOM), Directorate for Systems Engineering
 and Development

INVESTIGATOR: Mr. J. L. Daley, Jr.

Objective To support the AVRADCOM Program Manager of the Integrated Helmet Development as necessary.

Progress Funds for this program were used to purchase four Air Force helmet helmets for use in evaluating various CI protective masks. Funds also were used for travel in support of this project. The remainder of the funds were used to purchase more "crushable" earcups for prototype devices for the new helmet.

Title Night Vision Goggles Attitude Display Concept Evaluation Program, Phase II

FUNDED BY: Directorate of Combat Developments

INVESTIGATORS: Bruce L. Hamilton and Ronald E. Simmons

Objective A Letter of Agreement (LOA) was signed during June 1981 which committed the Naval Air Systems Command (NAVAIRSYSCOM) and USAARL to conduct joint research, funded by the Directorate of Combat Developments (DCD), on a heads-up-display with dynamic attitude indicator, integrated with night vision goggles. The research will evaluate the effectiveness of new display technology and focus upon determining whether or not the heads-up-display could effectively be used by pilots. Crucial to this evaluation is the quantitative documentation of changes in pilot workload as a function of the heads-up-display when used in various flight environments.

Progress A protocol for testing has been approved by the three organizations involved. The heads-up-display was delivered by Bell Helicopter Textron to USAARL on 1 March 1982. Computer programing flaws and a hardware failure were identified during the initial evaluation. Bell Helicopter Textron has been contracted by NAVAIRSYSCOM to make the necessary changes and testing should commence in the second quarter of FY 83.

Title US Coast Guard Scan Behavior During Search and Rescue

FUNDED BY: US Coast Guard Research and Development Center

INVESTIGATORS: N. Joan Blackwell, Ronald E. Simmons, and
 Jimmie R. Watson

Objective A joint laboratory project was initiated to determine the role of eye movements/performance of US Coast Guard lookouts.

scanners during dynamic search and rescue operations. The specific objectives of the investigation included: (1) determine the portion of time that lookouts/scanners actually spent on visual search; (2) determine the patterns of eye movement, eye fixations, and head movement used by experienced versus novice lookouts/scanners; (3) investigate eye movements and lookout response just prior to target detection; and (4) correlate scanning patterns with target detections as a measure of lookout effectiveness.

Progress The resulting data revealed the scanning methods prescribed in various Coast Guard training manuals are not being used. Instead, the majority of observers engage in a phenomenon termed "eye lock," where they position their eyes in the visual scene and allow the movement of the vehicle to dictate their scan pattern. The tendency of observers to scan along geometric lines within their fields of view also was noted. The complete methodology and results of this study have been published as USAARL Report No. 82-7.

Title Measurement of Head and Chest Accelerations of Tank Gunner During Gun Firing

FUNDED BY: Naval Surface Weapons Center, Dahlgren,
Virginia, Human Engineering Laboratory (HLL),
Aberdeen Proving Ground, Maryland

INVESTIGATORS: Ted Hundley, James A. Lewis, and
Donald C. Schneider

Objective To measure the head and chest accelerations imposed on the gunner during the firing of the tank gun. This information is needed to support the design requirements for the Mobile Protected Weapons System/Mobile Protected Gun program. There is some concern about the ability of the tank gunner to perform effectively when subjected to the recoil of large caliber guns mounted on lightweight air-mobile tanks. A program has been initiated by HLL in concert with the Marine Corps and Navy to investigate the problem.

Progress Acceleration data have been gathered on volunteers and dummies during two separate firing tests. The data have been reduced and analyzed. A final report on those results is in draft form. Additional work is planned using volunteer human subjects and a recoil simulator.

Title Development of a Test Method for Evaluating the Effectiveness of Helmet Retention Systems

FUNDED BY: Naval Air Development Center, Warminster,
Pennsylvania

INVESTIGATORS: Ted Hundley and Joe Laley

Objective Helmet loss during ejection and parachute operation continues to be a problem for the US Navy. Current helmet retention system tests are not adequate for evaluation of their flight helmets. They have requested that we attempt to develop a retention system test that will adequately test the dynamic strength and stability of flight helmet retention systems.

Progress A potentially acceptable test method has been developed. The necessary test equipment has been ordered and some of it has been received. The helmets that the Navy wants tested have been ordered. Upon receipt of all the materials, testing will be initiated.

Title Survey for Toxic Contaminants in the BLACKHAWK Helicopter During HELFIRE Missile Launches

FINDED BY: US Army Missile Command, Redstone Arsenal, Alabama

INVESTIGATORS: William A. Chaffin, Jr., and
Richard M. Reber

Objective To monitor the concentrations of HCl and CO at the crew stations of the BLACKHAWK during missile launch and determine the real-time concentrations of the contaminants before, during, and after launch of the missiles.

Progress Project was completed by publication of USAARI letter report #82-7-5-1.

Title Concept Evaluation Program Test of the Program of Instruction for the Pilot Night Vision System (PNVS) in a Surrogate Aircraft

FINDED BY: US Army Aviation Board, Fort Rucker, AL

INVESTIGATOR: MAJ William L. McLean

Objective To monitor the Integrated Helmet and Display Sighting System (IHADSS) to determine problems with proper fit and alignment and individual adaptability to PNVS. The questions concerning eye dominance and visual suppression of successful operators of this unique monocular system will be investigated.

Progress Before and after eye examinations have been completed on 16 of the projected 24 subjects. Right different measures of eye dominance were taken and preliminary indications of eye dominance as tested does not appear to be correlated to successful use of the PNVS. One area of difficulty has been with spectacle-wearer candidates. The helmet-mounted display is partially blocked by spectacles, preventing optimum use of the PNVS. After completion, test results will be reported.

Title Acoustic Evaluation of Samples of Helmet Compatible Communication Aural Protective System (HICAPS)

HANDLED BY: US Army Natick Research and Development Laboratories, Natick, MA

INVESTIGATOR: Mr. Ken L. Mago

Objective Determine the electro-acoustic characteristics of the "talk-through" circuit and the hearing protective characteristics of the muff system, to include distortion frequency response and acoustic output using device in combination with insert protection.

Progress No progress to date. Items will not be delivered for evaluation until the second quarter of FY 83.

Contracts

The comprehensive extramural contract program contributes to HSAARE's established scientific programs. In FY 82, three contracts were completed, five were granted extensions, and two new contracts were let. Nine contracts will continue into FY 83.

Title Hearing Protection Against Low Frequency Weapon Noise

CONTRACT NO. DAMD 17-82-C-2105

CONTRACTOR: Auburn University, Auburn, Alabama

INVESTIGATOR: K. M. Broughton, Jr.

Objective The objective of this research is to discover what material properties are responsible for noise attenuation in foam earplugs. Recommendations should then be possible for materials and construction of an improved earplug.

Progress Samples of foams having various formulations and densities were obtained. The samples were screened for best candidates based on attenuation. One earplug sample, filled polyvinyl chloride, exhibited extremely good low frequency attenuation. These best candidate samples were tested for storage modulus and loss modulus as a function of temperature and frequency. Analyses of test results are in progress.

Title Development of Auditory Localization Test Procedure

CONTRACT NO. DAMD-17-80-0131

CONTRACTOR: Florida State University, Tallahassee, FL

INVESTIGATOR: L. F. Elfner

Objective Current military weapons, such as the M198, VIPER, and M109, produce blast overpressures which require combinations of hearing protectors. The contract will develop methods to determine the effects of these protectors on the ability of soldiers to localize sounds. The localization of sound is considered essential to safety and operational effectiveness. Results of this study will have direct implications for improved protector design and provide a methodology to be used throughout the development of future hearing protective devices for use around Army weapons.

Progress Data collection and analysis have been completed on the azimuth identification experiment. Circumaural hearing protectors which include active "talk-through circuits" have been shown to induce 180° shifts in perceived azimuth when the circuits were turned off. With the active circuits turned on, localization was virtually eliminated. These findings were reported at the 103d meeting of the Acoustical Society of America, April 1982. Work on a motor-driven, boom-mounted speaker for localization testing has been delayed due to deficiencies in the laboratory's new anechoic chamber. Fabrication of the motor boom assembly has been completed.

Title Evaluation of Inner Ears of Chinchillas for Loss of Sensory Cells

CONTRACT NO. DAMD 17-80-C-0109

CONTRACTOR: University of Texas at Dallas, Richardson, TX

INVESTIGATOR: R. P. Hamernik

Objective To determine extent of damage to the cochlea from noise exposure.

Progress Processing of all cochleas received from USAARL has been completed. Data were supplied in the form of a compendium of cochleograms showing percent sensory cell loss as a function of position on the basilar membrane. The histological results from three experiments show a reasonable agreement between damage to the cochlea and permanent loss of hearing. Data analysis is still in progress.

Title Statistical Analysis of Helicopter Pilot Performance During Instrument Flight Across Repeated Flights

CONTRACT NO. DAMD 17-81-C-1174

CONTRACTOR: Jacksonville State University, Jacksonville, AL

INVESTIGATOR: L. A. Smith

Objective Flight commanders must have as much information as possible concerning the length of time that helicopter pilots can safely and successfully fly during extended operations. Examination of pilot performance data during simulated extended operations along with concurrent visual performance data will facilitate a description of the total primary workload of aviators during IFR conditions and will allow an assessment of any degradation of performance which may occur.

Progress During the first year of this contract, the visual performance data collected by the Laboratory during simulated helicopter sustained operations were subjected to statistical analysis. Preliminary results provided mathematical support for the Laboratory's procedure of classifying the dependent visual variables and the visual zoning concept. Additionally, the efforts of sustained operations on visual performance appear to be confounded by the intersubject variability suggesting the subject population was not homogeneous. Contract has been extended for an additional year with investigator, G. W. Yunker.

Title Blast Trauma: The Effects on Hearing

CONTRACT NO. DAMD 17-80-C-0135

CONTRACTOR: University of Texas at Dallas, Dallas, TX

INVESTIGATOR: R. P. Hamernik

Objective The objective of this study is to extend our basic knowledge of the nature of injury to the hearing receptors resulting from exposure to impulsive sounds (blast overpressure). Army weapons systems produce impulse noise which may be hazardous to hearing. Our current data base from which to assess the hazard is inadequate. The results of this study will contribute to that data base by providing new information about the nature of the injury.

Progress Freexposure thresholds and psychophysical tuning curves have been obtained on 8 chinchillas. The 8 animals were exposed to noise at 160dB peak pressure; and postexposure testing is in progress. Two of the 8 animals have completed postexposure threshold and psychophysical tuning curves. They showed small threshold shifts and aberrant tuning curves in the 2.0 kHz region.

Title Cochlear Microphonic Response to Low Frequency Noise

CONTRACT NO. DAMD 17-78-C-8367

CONTRACTOR: University of Florida, Gainesville, FL

INVESTIGATOR: D. C. Eggs

Objective To determine the mechanisms of high frequency hearing loss from low frequency noise.

Progress Data have been obtained on several animals showing the single auditory neuron response to low frequency noise. Preliminary analysis indicates that changes in the interval histogram distribution of neural interdischarge intervals occur in some units as the level of the noise is increased. At this time there is insufficient data to draw conclusions; however, there is a hint of a non-linear process in the preliminary data.

Title Effects of Visibility

CONTRACT NO. DAMD 17-79-C-5124

CONTRACTOR: Institute of Medical Sciences, Smith-McClellan Institute of Visual Sciences, San Francisco, CA

INVESTIGATOR: Anthony G. Adams
Gerrilla Baeyerstrom-Fortney

Objective Investigate spatial, temporal, and retinal eccentricity effects on visibility in the dark-adapted eye.

Progress Research completed; however, report has not been produced by contractor. Project terminated.

Title Mechanisms of Human Injury

CONTRACT NO. AR 11-79-PA25-440

CONTRACTOR: Wayne State University, Dayton, Ohio

INVESTIGATOR: Albert King

Objective The executive agent for this triservice study is the US Air Force Aerospace Medical Laboratory, Wright Patterson Air Force Base, Ohio. The objective is to determine mechanisms of injury when deceleration is applied to human surrogates in the 11.6 energy-absorbing pilot seats. Overall, this work supports the triservice human tolerance investigation.

Progress The test program under FAA funding was completed and the data was submitted by Wayne State University. Project is complete.

Title A Finite-Element Model Analysis of the Protection Provided by Army Aviator Helmets to the Human Head and Neck

CONTRACT NO. DAMD 17-81-C-1186

CONTRACTOR: University of Iowa, Iowa City, IA

INVESTIGATOR: Y. K. Liu

Objective To develop a method to assess the probability of head and/or neck injury for a specified input pulse to a helmeted head.

Progress Research has been completed; and contractor plans to present results to USAARL personnel during first quarter FY 85.

Title Modification of Anthropomorphic Dummies for Spinal Load Measurement and Support of Testing

CONTRACT NO. DAMD 17-81-C-1175

CONTRACTOR: Simula, Incorporated, Tempe, AZ

INVESTIGATOR: S. P. Desjardine

Objective To simulate previous human cadaver tests with instrumented dummies for comparability. This work will provide a method of relating dummy tests to injury mechanisms found in cadaver tests.

Progress The work was completed and a report issued. The data showed a good similarity between dummy and surrogate loads; however, the dummies required more stroking distance for seat "load-limiting" devices than did the surrogates.

Title Effect of U.S. Army Headgear on Neck Muscle Loading and Fatigue

CONTRACT NO. DAMD17-80-C-0089

CONTRACTOR: Wright State University, Dayton, OH

INVESTIGATOR: C. A. Phillips

Objective To supplement the current data bank of helmet loading configurations with additional experiments in order to define the necessary boundary conditions for a realistic mathematical model and develop an appropriate empirical mathematical model to predict both forward and lateral neck muscle endurance for any weight-C.G. configuration within the boundary conditions.

Progress The isometric strength of the neck muscles is progressively greater in the head lateral, head backward, and head forward, respectively. A generic evaluation of helmet weight and center of gravity for 27 permutations has been completed with results forthcoming in first quarter FY 85. A proposal to culminate these empirical tests with a multiple linear regression mathematical model is presently being reviewed.

Title The Effects of Helicopter Vibration on the Spinal System

CONTRACT NO. DAMD17-82-C-2155

CONTRACTOR: University of Vermont, Burlington, VT

INVESTIGATOR: M. D. Lepe

Objective To measure volunteer response to three axes UH-1 helicopter vibration in age-matched females and males. To establish the relationships between vibration posture and possible causes of low back pain in the Army rotary wing aviator.

Progress The development of an experimental method and a test device have been completed. A data acquisition system has been designed, and subject evaluation is scheduled for first quarter FY 85.

Personnel

The educational and skill levels of the laboratory's assigned personnel are continually increasing. These increases come through assignment of highly qualified new personnel, completion of some long-term educational goals by others, and through the initiative and personal determination of those who pursue after-duty study. One civilian employee participated in the Senior Executive Education Program conducted by the Federal Executive Institute during FY 82. Another made application for long-term training under CPR 400. This was approved, with training to begin in January 1983.

Training is a vital element in maintaining and improving the proficiency of assigned personnel. Twenty-five military and 44 civilians received training and professional development during FY 82. In addition, such training experiences as professional conferences, seminars, and short courses benefited 21 people.

Among the laboratory's professional personnel, there are 22 doctorate, 19 master, and 32 bachelor degrees.

Mandatory training requirements were met by all military personnel. In the skills qualification testing for FY 82, USAARL military personnel had a 96 percent pass rate. Thirteen persons reenlisted or extended their enlistment for a total of 44.4 years.

PERSONNEL BY CATEGORY

<u>Category</u>	<u>Authorized</u>
Professional	56
Scientists (44)	
Engineers (6)	
Other (6)	
Skilled Technicians	60
Administrative	10
Clerical	<u>26</u>
TOTAL	152

PERSONNEL STRENGTH

			CIVILIAN		CO-OP	STUDENT	
FY 80	OFFICER	EM	PERM/TEMP		STUDENT	AIDS	TOTAL
AUTHORIZED	30	47	59	6	0		142
ACTUAL	24*	42**	57	3	9		135
FY 81							
AUTHORIZED	30	47	61	12	0	0	150
ACTUAL	28*	48**	56	6	6	4	148
FY 82							
AUTHORIZED	31	47	62	12			152
ACTUAL	29	54	60	10	6		159

*Includes one Navy Officer

**Includes one Air Force Sergeant

USAARL SCIENTIFIC AND TECHNICAL DISCIPLINES

Physiology
Optical, Acoustical, Neurophysiology

Psychology
Behavioral, Experimental, Research

Medicine
Aviation, Occupational, Internal, Veterinary

Engineering
Aerospace, Mechanical, Biomedical, Electronics, Electrical

Environmental Hygiene

Drafting and Illustration

Biochemistry

Optometry

Audiology

Pharmacology

Aviation

Biology

Physics

Mathematics

Photography

Computer Science

Co-Op Program

The Cooperative Education Program continued to thrive at USAARL. What started as an experiment has become an active program with the demand for Co-Op students exceeding the authorizations. A new Co-Op coordinator, Ms. Sybil Bullock replaced MAJ Webster Langhorne. Ms. Gail Jay continued to provide administrative support to the program.

Two additional Co-Op spaces were authorized for USAARL for a total of 11 positions. A total of 26 students were in Co-Op roles in FY 82. Twelve were new students and seven were graduate students. The first conversion of a Co-Op student to a permanent position was completed in the Biomedical Applications Research Division during FY 82. Two additional requirements were established in the career fields of microbiology and bioengineering.

During FY 82, three new universities were added to our program: Texas A&M University, the University of Southern Mississippi, and Southern University.

recruitment trips were made to Georgia Tech, Tuskegee Institute, Alabama A&M, and Alabama State University. USAARL participated in career days at the University of South Alabama and the University of Florida.

Worker-Trainee Program

USAARL became a participant in this program in May 1981. Three civilian clerical employees have been trained to GS 7 proficiency and placed in permanent positions.

USAARL supervisors have again volunteered their assistance in furthering this vital affirmative action program. Two clerical trainees were requested in September 1982. Training is expected to begin early in FY 83.

01H Program

As a direct result of maintaining over 100 percent fill USAMRDC wide, the recruitment of 01Hs received little emphasis during FY 82. In December 1981, USAMRDC had 185 authorized slots with 198 assigned. In September 1982, USAMRDC had 187 authorized with 228 assigned. The position of USAMRDC central coordinator was returned to the Office of the Command Sergeant Major, USAMRDC, in February 1982.

Mobilization Designee (MOBDES) Program

The MOBDES program preassigns selected US Army Reserve (USAR) officers. These officers have contributed to the expansion of the USAMRDC in both scientific and administrative positions. In its 15 designee positions, the USAARL MOBDES program includes allied science officers, medical officers, aviators, and combat arms officers. Filling only half these positions, many designees have completed second terms, while all have made significant contributions to the aeromedical research program. Significant accomplishments this year included forecasting of facilities requirements for expanded programs, establishment of an electron microscopy laboratory, and automation management review and analysis.

Equal Employment Opportunity (EEO) Program

Affirmative action continued to be emphasized at USAARI. With the publication of the first statistical analysis of the work force and the identification of specific barriers to the employment of women and minorities, specific goals were established to reduce under-represented groups. Some of the accomplishments of these goals include the following: the first conversion of a cooperative education student to permanent position (white female to research psychologist), the first female electronics technician (black female, GS-11), the first Hispanic male permanent employee (photographer), the first USAARI Junior Fellowship Student (white female), the first female Acting Division Director (white female), the first female co-op coordinator (white female), and the first Federal Laboratory Consortium member (white female).

Classes in equal employment opportunity and the aspects of sexual harassment were taught to USAARI personnel. An analysis of awards and training by race and sex indicated that awards and training were being given proportionate to the representation of women and minorities in the work force.

Junior Fellowship Program

A quota for this program was made available to USAARI in FY 82. An assessment of proposed work assignments was made, and the Scientific Information Center, because of its varied functions, was selected. The "fellow," a valedictorian of a local high school, began her work assignment as a GS-2 library aide. Her career goals include an interest in medicine and automatic data processing. Training received on the job has furthered these goals and enabled the Junior Fellow to target her formal education toward these goals. She is a full-time student at a local junior college. Under this program, she works vacations and holidays as a full-time employee of USAARI.

Federal Women's Program

USAARI has an active Federal Women's Program headed by a Federal Women's Program Manager (FWPM) and an alternate FWPM. This program provides information on employment, training, and recruitment opportunities to women employed at USAARI. The USAARI FWPM is a collateral duty assignment appointed by the Commander, USAARI, and is his staff adviser on matters affecting women.

Former USAARL specialist joins officer rank

Helmet Research Means Safer Flight

By J.J. JOHNSON

FORT RUCKER — It may be premature to report that a new military aviation helmet will be adopted in the immediate future. But a more than safe prediction is that the number of pilots escaping survivable accidents with equipment head so data being generated.

In World War II it was that will soon be replaced by modern research aerospace engineer. Haley, Navy Lt. Col. Tom Reading and Army Aviation Association of America professional luncheon Friday at the Officer's Club.

The helmet damage head injury correlation studies are only a part of the U.S. Army Research Laboratory (USARL) program. USARL is but one of the U.S. Army Research and Development Command, civilian military scientists to eliminate medical equipment hazards to

SEVERAL PROTOTYPES

are being evaluated, but Haley and Reading believe a "crashable" carapace will provide the impact protection needed. Within less than a second, the "extremely rigid" material now used releases

in the helmet impact studies

are analyzing a variety of materials, but a "highly refined nylon cloth" — Kevlar — has the nod over the present fiber glass shell. The quest, Haley said, is to reduce the helmet's overall weight from

By Lee Ann Smith

The Outstanding Aviation Unit of the Year and three individual aviation annual awards were presented at the Army Aviation Association of America's professional luncheon Friday at the Officer's Club.

May Gen. Story C. Stevens, commander of the U.S. Army Aviation Research and Development Command, headquarters at St. Lewis, Mo., was guest speaker.

The certificate awarded for the post's Outstanding Aviation Unit of the Year went to the U.S. Army Aeromedical Research Laboratory (USARL).

Department of the Army Civilian of the Year was presented to John Hickey of Dothan, chief of the Office of Accident Prevention.

CWO3 Robert E. Browning of Eatonville, N.J., received the Army

Terrance J. McElroy who works with the at and migratory patterns of the released Aircrew Training Manual Flight also served as a member of the team. Schedule at the Instrument and Aviation Qualification Section at Cairns Army Airfield. McElroy is from Thornwood, N.Y.

After the certificates were awarded, Stevens gave a slide presentation on the advancement Army aviation has made in basic research, engineering development and engineering safety techniques.

Stevens discussed various: tions around the United States in making improvements in such as safety features, future safety and minimizing the eq the cockpit.

He said the Research and Development Command is "making it the pilot to do his job."

The next AAAA meeting conjunction with the Birt

By June Greer

Former Sp4 David B. Priser was commissioned a first lieutenant in the Chemical Corps of the U.S. Army last Thursday ceremonies held at the U.S. Army Aeromedical Research Laboratory (USARL). Carol Priser beamed with pride as she pinned the shiny silver bars on her husband's shoulders.

The move from an enlisted to a commissioned status is not unheard of, but to go from a specialist six to first lieutenant from aviation to medical research to the Chemical Corps is not routine.

According to Col. Stanley C. Knapp, commander of USARL, the sudden change in status is not so sudden when Priser's education and background are considered.

Priser graduated from Manchester College, North Manchester, Ind., with double majors in biology and environmental sciences. He needed only a few credits to have a history major as well.

Economic conditions in 1974 convinced Priser the Army could use his skills as a biological science assistant (B1). He enlisted and was assigned to the Biomedical Laboratories at Aberdeen Proving Ground, Md.

In 1975 the peregrine falcon entered Priser's life. The falcon, an endangered species at that time, was the Eastern seaboard. Priser was assigned to studies project where peregrine falcons were, then released so as to re-introduce the Eastern seaboard.

a few years riding a jeep across the dunes and migratory patterns of the released Aircrew Training Manual Flight also served as a member of the team. Schedule at the Instrument and Aviation Qualification Section at Cairns Army Airfield. McElroy is from Thornwood, N.Y.

en assigned to USARL since March 1980 as science assistant. He has assisted in the study on research into vibration's effects on human beings from various seat configurations. He has recorded and analyzed computer programs assisting in data and engineering safety techniques.

ing as research subject have all been part

King to speak at seminar

Dr. Albert I. King, director of Wayne State University's Biomechanics Center at Detroit, Mich., will speak at the U.S. Army Aeromedical Research Laboratory (USARL) seminar, June 13 at 9 a.m. King's topic is "Spinal Injury Mechanisms During Impact Acceleration."

The lecture will be concerned with vertical acceleration studies carried out at Wayne State University using their unique wind tunnels. Results of completed studies and a mathematical model that simulates spinal response to impact acceleration will be presented.

King received his bachelor of science degree from the University of Hong Kong and his masters of science and his doctorate degrees from Wayne State University. In addition to being director of the Biomechanics Center, he is a professor, Mechanical Engineering Department, and Associate, Department of Neurosurgery, School of Medicine, Wayne State University.

The principal areas of King's research are spinal injury, muscular response to impact acceleration, vehicular and pedestrian safety and clinical biomechanics.

He is a member of the American Society of Mechanical Engineers, American Society of Engineering Education, Association of Automotive Engineers, Stapp Car Crash Conference, Committee, American Academy of Orthopedic Surgeons, charter member of the International Society for the Study of the Lumbar Spine. He also serves on the editorial board of the Journal of Biomechanics. Residents interested in King's topic are invited to attend USARL seminar. For additional information call Lt. Col. Priser 255-6806.

Price assumes command of Research Laboratory

By Al Endicott

Col. Stanley C. Knapp turned over command of the U.S. Army Aeromedical Research Laboratory (USARL) to Col. Dudley K. Price in ceremonies here Friday.

Major Gen. Raymond R. Knapp, commander of the U.S. Army Medical Research and Development Command, Ft. Monmouth, N.J., said USARL personnel and the Army's medical department is proud of what they have accomplished in the past and also proud of the laboratory's 20th anniversary today, June 12.

Knapp said Knapp's "belonging" life's made major contributions to medicine he gathered to say good-bye to a distinguished physician. Knapp, who assumed command of USARL, assured the expansion of the command's role research had in the past, been directed to research, but he saw the requirement for research work involving such as combat vehicle overpressure and impulse noise from individual served weapons.

Knapp, who will be assigned next to the Rapid

Joint Task Force at MacDill Air Force Base, Fla., said, "I love this organization. It isn't the front office man that makes it work, but the people. We've had our ups and downs, but we've met all our goals."

He also said the USARL potential is very high and that the

Congressman lauds new Rucker facility

By AMY HERRING

South Alabama Bureau

FORT RUCKER — The newly opened United States Army Aeromedical Research Laboratory at Fort Rucker will have worldwide significance, U.S. Rep. Bill Dickinson said Friday.

The \$7.7 million facility officially opened its doors Friday to more than 150 employees and their families. Army officers and officials and interested persons.

Dickinson said the center, begun in May 1978, would be important to Army aviation and life everywhere.

"We have been the leader for quite some time and now we will be adequately able to house our center," the congressman told about 100 persons who attended the ribbon-cutting

ceremony. "We can now meet today's needs and also the needs of tomorrow."

Prior to opening the new 116,620-square-foot facility, the base's research was conducted in vacant World War II hospital wards. When the labs opened in 1967, the research facility employed 30 persons. At present, the center employs 150 persons and conducts research in more than 100 fields.

"It is fitting that the world's best Aeromedical Research Laboratory is located at the world's largest helicopter training center," Dickinson said. "All of aviation will prosper, grow and benefit from this center."

The center conducts research into flight safety, medical fields, chemical warfare and other aviation-related fields according to officials.

USAARL's FWPM is also a member of the Federal Women's Program Committee (FWPC) of the Commanding General, Fort Rucker, AL. This committee provides the Commanding General with advice and information regarding issues affecting the Federal Women's Program (FWP) and the female employees in the Fort Rucker work force, develops proposals for improvements in the FWP at Fort Rucker, and provides assistance in developing the Installation's Affirmative Action Program. During the past year, the FWPC cosponsored the Secretary's Luncheon during National Secretary's Week, a program for Women's History Week, a program for Women's Equality Day, and the Federal Women's Week.



Personnel Achievements

Civilian Awards

No. Presented

Commander's Award	1
Certificate of Achievement	1
Special Service Award	2
Sustained Superior Performance Award	5
Exceptional Performance	14
Quality Step Increase	1

Military Awards

Meritorious Service Medal	4
Army Commendation Medal	8
Army Achievement Medal	3

Promotions

Officer	2
Enlisted	6
Civilian	
Permanent	5
Temporary	2
Co-Op Students	5

Special Recognition

USARI Soldier of the Year (2d Award)

SP5 Leon Kaylor

General Spruance Award for Aviation
Safety Through Education (SAITE)

SFC Gerald L. Johnson

James H. McClellan Aviation Safety
Award (AAAA)

SFC Gerald L. Johnson

USAARL'S New Facility

The long-awaited move became a reality in October 1981 with the acceptance of the main building of the new research facility. Moving equipment and supplies by all divisions was a long, tedious project; however, at the end of December 1981, the move was complete for all but the auditory group.

This environmentally-efficient facility of 116,620 square feet houses a myriad of high technology equipment. One million pounds of structural steel, 29 million pounds of concrete, and 43 miles of electrical wire are among basic building specifications of this 400-door structure. A centrally-located computer center monitors control of experiments and acquisition and analysis of data. Floors with microwave repelling walls, seismically isolated floors, an anti-echo chamber large enough to house a two-story building, and demountable walls to facilitate building modification are but a few of the new features that make the facility amenable to research and development.

With adequate space and modern facilities, USAARL personnel continue to work on projects designed to make the American soldier's life an easier and much safer one.



Scientific Programs

USAAARI's scientific research is organized under the USAMRIID's major research areas. Under each of these research areas, USAMRIID has an established scientific program or programs. A scientific program involves one or more individual projects conducted by a D-term 1498. This is a convenient system for organizing the work we do, and it makes it easier to trace compliance with OMB guidelines.

The research areas and the D-term 1498s that pertain to them are as follows:

RESEARCH AREA	USAMRIID PROJECT NUMBER	USAMRIID PROJECT TITLE	USAMRIID PROJECT NUMBER
HEALTH AND SAFETY OF MILITARY PERSONNEL IN THEATER	1498-1498	HEALTH AND SAFETY OF MILITARY PERSONNEL IN THEATER	6.11.01.A CB 283
Military Aspects of Mechanical Engineering	1498-1498	Military Aspects of Mechanical Engineering	6.11.01.A CB 282
Ultrastructural Retinal and Optic Nerve Vertebrates	1498-1498	Ultrastructural Retinal and Optic Nerve Vertebrates	6.11.01.A 00 292
Assessment of Visual Performance Based Upon New Knowledge of Retinal Function	1498-1498	Assessment of Visual Performance Based Upon New Knowledge of Retinal Function	6.11.01.A 00 278
HAZARDS OF MECHANICAL INJURY RESEARCH AREA			
Auditory Effects of Blast Overpressure	1498-1498	Auditory Effects of Blast Overpressure	6.17.77.A AA 156

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TITLE	DA ACCESSION NUMBER	PROGRAM ELEMENT, TASK AREA, WORK UNIT
Medical Assessment of Hearing Protective Devices	DAOB 6886	6.27.77.A AC 135
Biodynamics of Life Support Equipment and Personnel Armor	DAOG 0167	6.27.77.A AG 131
Biodynamics of Impact Physiology	DAOD 6735	6.27.77.A AG 137
Vibration Hazards of Combat Aircraft and Vehicles	DAOG 6100	6.27.77.A AD 132
Biomedical Application and Health Hazard Assessment of Oxygen Enrichment Breathing Systems	DAOG 0169	6.27.77.A AF 134
Research Countermeasures for Significant Medical Hazards in Military Systems	DAOG 0165	6.27.77.A AF 133
Development of Military/ASTM Standard Method for Rapid Assessment of Burn Hazard	DAOH 0152	6.11.01.A 00 291
Cardiopulmonary Physiology in Army Aviators	DAOG 1505	6.11.02.A 00 279
COMBAT CREW EFFECTIVENESS RESEARCH AREA		
Military Visual Problems: Assessment, Mechanisms, and Protection	DAOB 6893	6.27.77.A BG 164
Research Directed at Biomedical Parameters Affecting Aircrew Workload During Sustained Operations	DAOG 0153	6.27.77.A BH 161
Visual Performance Research Related to Operational Problems in Army Aviation	DAOG 0156	6.27.77.A BH 162
Parametric, Multimodal Workload Assessment in Aircraft Guidance Systems	DAOG 6101	6.27.77.A BH 163

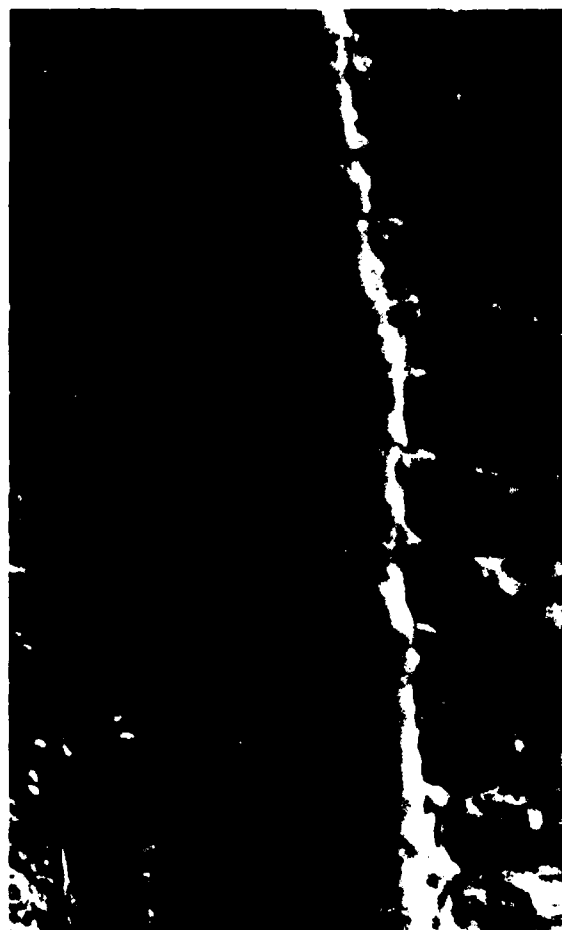
TITLE	DA ACCESSION NUMBER	PROGRAM ELEMENT, TASK AREA, WORK UNIT
Aeromedical Research of Operationally Significant Problems in the Army Aviation Environment	DACG 0151	6.27.77.A BH 165
Anthropometric Criteria for Army Aviators	DACG 6102	6.27.77.A BH 166
SOLDIER CHEMICAL WARFARE AGENT ANTIDOTE RESEARCH AREA		
Antidote and Antidote/Agent Effects on the Visual System	DACG 8399	6.27.34.A AO 381
Effects of Nerve-Agent Antidotes on the Visual System	DACG 1506	6.11.01.A 00 277

Systems Health Hazard Research Area

This basic research project area principally involves the development of the minimum biological and biomedical data bases necessary and sufficient to protect personnel from hazards generated by Army systems, combat operations and work environments. Research efforts are directed toward those physiological and biomedical technology bases which provide the foundation for the more applied USAARL research programs addressing military systems and operations presenting potential health hazards. Investigations in this program include studies to provide quantitative information on the physiological processes and mechanisms subserving visual perception, studies to determine the physiological mechanisms of auditory injury from noise, vibration, and chemicals, and studies to determine bone, joint, and tissue response to vibration and blunt trauma.

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Visual and Auditory Impact Physiology Program

Background

The development, fielding, and use of modernized weaponry, along with new doctrine, will, in the future, threaten to subject the modern soldier to forces and demands which exceed his biological limitations. For example, increased noise levels and exposure profiles for a broad range of weapons will place additional demands on the capability of the human ear to withstand high noise environments and still function adequately. New combat doctrine which places increased priority on night operations and target detection raises questions about the soldier's visual capabilities and effective procedures for maintaining and enhancing them.

The operational questions and problems which arise from new weaponry and doctrine require biomedical technologies and criteria for effective solutions. These technologies and criteria, in turn, demand sufficient biomedical data bases to support applied efforts. In most cases, however, the required data bases are either nonexistent or woefully inadequate. Consequently, the need for new biomedical data to support solutions to contemporary and future-oriented problems is substantial. USAARL's basic research program is designed to meet this need.

Obviously, future-oriented Army problems are critical in guiding the basic research program. However, not all of tomorrow's problems and questions are foreseen today. In order to maintain a scientific base capable of addressing unforeseen problems, a proportion of the basic research is nonproblem oriented in nature. This serves at least two primary purposes. First, it adds to our knowledge of basic biological principles; and second, it keeps our scientists abreast of current findings and thinking in biological sciences such that this knowledge may someday be applied to help and protect the individual soldier.

The generic goal of the basic research program is to provide biomedical data bases, along with technical concepts, to support applied research and development efforts of the laboratory. The applications for these data bases include damage-risk criteria, medically valid design criteria, medical input to doctrine and tactics, and medically-based technologies. Secondary goals of the program are to maintain professional proficiency of the scientific staff and to identify new concepts and technologies developed elsewhere with potential value for Army applications.

Objective

The primary objectives of this research program in animal models for the study of visual and auditory function are: providing a data base on energy injury relationships for man; and, second, to provide quantitative information on the physiological processes and mechanisms which underlie visual perceptual function, and validating concepts for new methods, techniques and instrumentation to assess sensory capabilities and degradations.

Progress

In the visual physiology program, two instrumentation development projects were completed: an electronic system for producing well controlled spatial-temporal patterns on a CRT and a three channel Maxwellian view optical system which uses light emitting diodes as sources. Further, support was provided for the establishment of an electron microscopical facility to provide ultrastructural and histochemical analysis of mammalian retinæ.

In an attempt to develop a suitable animal model for scotopic vision, a bushbaby breeding colony was established. Bushbabies have a predominance of rod retina. Initial anatomical analysis reveals the existence of a possible second photoreceptor type. Concurrently, pilot electrophysiological experiments were begun to analyze the photoreceptor properties of the bushbaby retina.

Initial experiments were begun to test the viability of noninvasive electrophysiological procedures for measuring the relative chromatic and achromatic perception (photopic and scotopic luminosity functions) of an individual. Results of the analysis will be compared directly with results from flicker photometry.

Initial tests of a system which provides for the rapid assessment of visual, spatial-temporal contrast sensitivity were begun. If the system proves viable, it will provide a useful basic, applied and perhaps clinical tool.

An exploratory study to develop behavioral audiometric procedures for the swine was completed. The results indicate that swine can quickly learn to perform an operant response. However, the inability to produce sufficiently high motivational levels resulted in a failure to determine an audiogram. A report of this study is in preparation.

A final report on the study of the role of pigmentation in susceptibility to noise-induced hearing loss is in preparation.

DD 1498

This work was conducted under Research and Technology Work Unit Summaries.

Physiology and Psychophysics of Information Transfer in the Visual System, DAOG 5999, 283.

Military Acoustic Hazards: Mechanisms of Hearing Loss, DAWG 6889, 282.

Ultrastructural Survey of Retinal and Cochlear Function, DAWG 6151, 292.

Assessment of Visual Performance and Cochlear Retinal Function, DAWG 1499, 278.

Contributing Work Low contract projects contributing to the research objectives of this program.

Evaluation of Inner Ear Clinically Isolated Cochlear Cells Using a Surface Preparation Method, DAWG 6151.

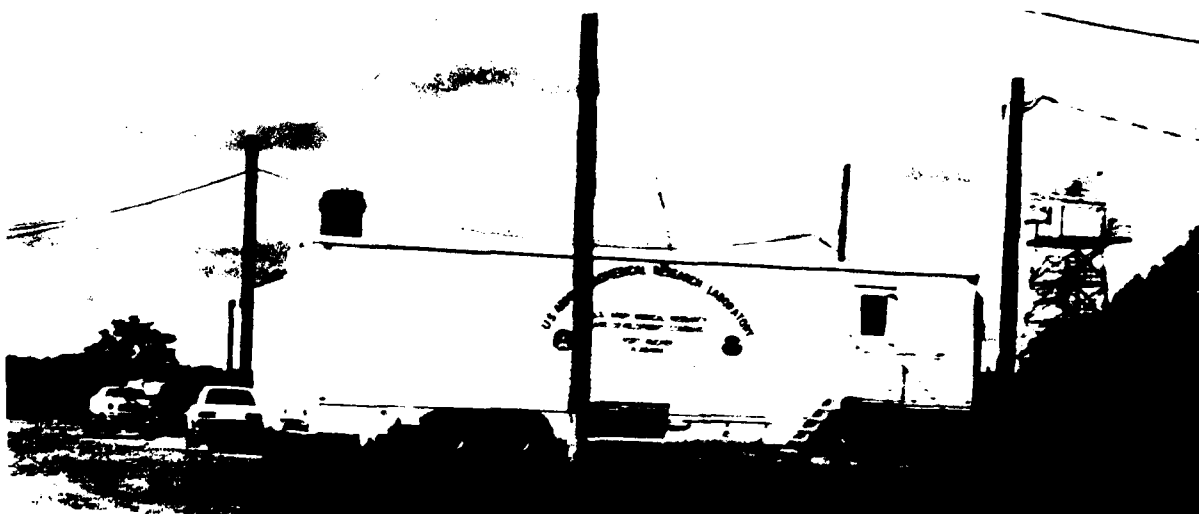
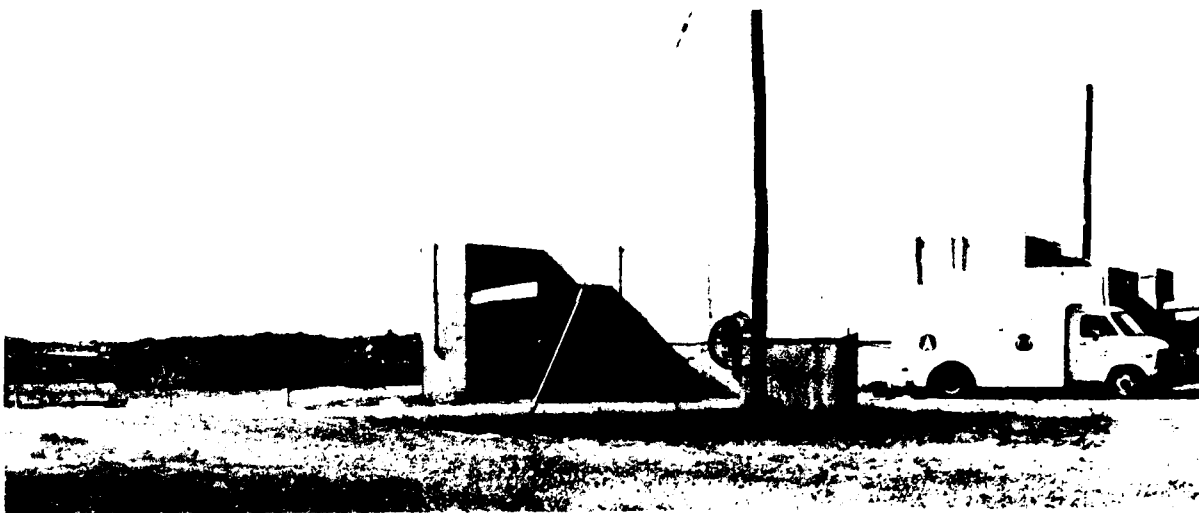
Research and Development of Cochlear Microphones for Low Frequency Noise.

Hazards of Mechanical Forces Research Area

Human health threats dealt with in this research area include, but are not limited to, those which are (a) inherent in weapons, (b) caused by or accompanying military operations, (c) generated during combat training, (d) inherent to certain microenvironments, and (e) produced by Army industrial operations. Examples include bone degrading vibrations present in armored vehicles, smoke-induced respiratory injury resulting from realistic training or equipment, heat stroke induced by wearing chemical protective suits in hot environments, and hearing loss attributable to artillery weapon noise. Efforts within this project area focus on identification and quantification of the various assaults experienced by military and civilian personnel, development of dose-response relationships for each assault, and development of injury prevention and health protection criteria and technologies.

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Auditory Effects of Blast Overpressure Program

Background Current Army weapons development efforts aimed at countering Warsaw Pact threat capabilities include improved artillery cannons, antitank rockets, and mortar, how artillery cannon and propellant charge are being developed to meet doctrinal requirements for enhanced delivery range, rapid rates of fire, and reduced weight for air mobility. Improved antitank rockets with high-energy propellants may be fired from reflective enclosures such as bunkers or covered foxholes. And, mortar technology is being advanced to achieve greater delivery ranges and rapid rates of fire. In each of these families of weapons, dangerously high levels of blast overpressure are a byproduct of advancing weapons technology.

The high levels of blast overpressure which will be commonplace on the modern battlefield pose potentially serious health hazards to soldier-operators. Air-containing organs such as the ear are particularly susceptible to injury, with serious medical consequences possible. Hearing loss, even temporary, among troops using blast-producing weapons can degrade critical soldier-machine performance, endanger effective command, control and communications, and disrupt critical combat tasks such as detection of the enemy during patrol missions. Hearing loss thus can endanger the soldier's capability to accomplish the combat mission. Further, permanent hearing loss is a cause of substantial disability compensation payments, even under peacetime conditions.

The existing exposure limit for impulse noise (i.e., blast overpressure) is based on a grossly inadequate biomedical data base and on a number of assumptions which have yet to be validated. The physical characteristics of the blast wave which are responsible for injury to the ear have not been completely identified, and the mechanisms of injury within the ear are understood only poorly. Consequently, improvements in protection technologies have been difficult to achieve.

The primary long-range goal of this research program is the establishment of a comprehensive biomedical data base to support the development of a valid damage risk criterion. A secondary long-range goal is the development of technology, approaches and devices

with potential for improved protection against blast-induced hearing loss. A significant short-range goal is the direct validation of the adequacy of state-of-the-art hearing protective devices for critical developmental systems.

Objective The major technical objectives include quantitative analysis of the physical characteristics of blast waves, development and validation of a large animal model for studying auditory injury, development of laboratory impulse noise exposure capabilities where pressure wave characteristics can be systematically varied, systematic animal studies to determine the relationship between physical parameters of blast waves and auditory injury, development, and validation of mathematical models to assess the effects of protective devices on effective impulse noise exposure criteria. Further, technical objectives include identification of the mechanisms underlying blast-induced hearing loss, identification of susceptibility factors predisposing individuals to blast-induced hearing loss, and development and validation of mathematical models for predicting blast-induced hearing loss.

Progress A field study was completed to directly assess the adequacy of E-A-R earplugs for the protection of crewmembers firing the M198. The results indicate the protection afforded by these plugs is adequate for up to 12 rounds per day of the top zone charge (M203). Based on these findings, the Office of The Surgeon General issued a recommendation for modified firing restrictions of this weapon system. Results were presented to the Research Study Group 6 of NATO Panel VIII and to the Technical Cooperation Program, Panel W2.

Studies with chinchillas to investigate the relationship between auditory injury and the number of impulses in the exposures were conducted. Preliminary results are not consistent with current standards. This work is being continued. Preliminary results were presented to the Research Study Group 6 of NATO Panel VIII.

PRESENTATIONS:

Preliminary Results of the Direct Determination of the Adequacy of Hearing Protection for Use With the M198, presented to NATO Panel VIII, Research Study Group 6, Effects of Impulse Noise, May 82.

Auditory Injury in Chinchillas as a Function of Number of Impulses, presented to NATO Panel VIII, Research Study Group 6, Effects of Impulse Noise, May 82.

Effects of Peak Pressure and Mixed Levels of Impulse Noise in Determining Auditory Injury, presented to the Technical Cooperation Program, Panel W2 Blast Overpressure Workshop, May 82.

Direct Determination of the Adequacy of Hearing Protection for Use with the VIPER Anti-Tank Weapon and the M108 Howitzer, presented to the Technical Cooperation Program, Panel W2 Blast Overpressure Workshop, May 82.

Preliminary Results of the Direct Determination of the Adequacy of Hearing Protection for use With the M108 Howitzer, presented to the DARCOM Blast Overpressure In-Process Review, Dec 81.

DD 1498 The above work was conducted under Research and Technology Work Unit Summary.

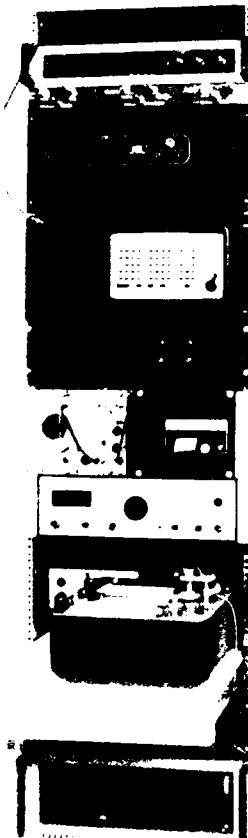
Auditory Effects of Blast Overpressure, DAOG 5998, 136.

Contributing Work Work done under the following contracts contributed to the research objectives of this program.

Blast Trauma: The Effects on Hearing.

Effects of Hearing Protectors on Human Auditory Localization.

Evaluation of Inner Ears (Chinchillas) for Loss of Sensory Cells Using a Surface Preparation Histology Technique.



Noise Hazards of Combat Vehicles Program

Background As part of a large-scale modernization program, the Army is developing or fielding advanced design combat vehicles for a wide variety of battlefield applications. Combat doctrine being developed for the battlefield of the future calls for high-speed, lightweight, all-terrain (i.e., tracked) vehicles for fighting and transporting troops, and also for heavily armored, yet high speed tanks with enhanced firepower. Also integral to the high intensity battlefield of the future will be high-performance helicopters with advanced design features. Such hardware combinations will generate hazardous levels of both steady noise from engines, sprockets, rotor blades, and the like, and impulse noise from machine guns, cannons, missiles, etc.

Coupled with such advanced hardware will be the requirement for continuous combat operations. This will have the effect of exposing crewmembers to greatly extended periods of steady and impulse noise in a 24-hour period. It also will likely induce fatigue and dehydration in large numbers of troops.

Extended exposure to hazardous levels of steady and impulse noise, especially when combined with other stressors, will present a serious risk of temporary and permanent hearing loss. Both types of hearing loss can degrade combat effectiveness by impairing effective command, control and communications, disrupting critical operator tasks, and degrading critical hearing-intensive combat activities. In addition, permanent hearing loss constitutes grounds for disability compensation.

The effective protection of troops from loss of hearing requires adequate hearing protective devices, both insert types and over-the-ear types. However, not all available hearing protective devices provide adequate protection. Rigorous evaluation of developmental equipment, including helmets with earcaps, communication headsets, and commercially available protective devices, is required to insure adequate protection. Further, an effective hearing conservation program requires up-to-date epidemiologic data on the

extent of hearing loss and the resulting impact among specific groups of Army personnel.

The primary goal of this research program is to assess the effectiveness of hearing protective devices in order to minimize the incidence and severity of noise-induced hearing loss among Army personnel. Long-term goals include (1) the development of improved technologies and approaches for hearing protection and (2) the development of improved methodology for evaluation of hearing protective devices.

Objective The major technical objectives of this research program include measurement of the sound-attenuating characteristics of passive and active hearing protective devices and communication headsets, determination of the suitability of selected devices for specific Army applications, assessment of the influence of user variables on protective effectiveness, development and evaluation of new concepts for improved hearing protection, development and validation of improved laboratory and field techniques (e.g., physical ear method) for evaluation of hearing protective devices, development and validation of mathematical models for predicting suitability of hearing protective devices, assessment of attenuation characteristics on audiologic performance, and epidemiologic assessment of the extent of hearing loss and the associated impact among selected groups of Army personnel.

Progress The attenuation characteristics of the Integrated Helmet and Display Sighting System (IHADSS) were evaluated to determine the hearing protective characteristics and properties of the communication system. The attenuation characteristics were reported in USAARL Letter Report 82-6-2-1 titled "Prototype Testing of the Integrated Helmet Unit for the Integrated Helmet and Display Sighting System." The NORTON Silent Bandit hearing protector was evaluated to determine acceptability for Army use from a hearing protection standpoint. The results of the test are being analyzed, and a report of the findings will be issued.

The standard hearing protectors used by Army personnel, described in TB Med 501, were evaluated to establish attenuation requirements when measured with ANSI S3.19, "Method for the Measurement of Real-Ear Attenuation of Hearing Protectors." The results of these measurements will be used to modify attenuation requirements in Military Specifications to reflect measurements completed with the current standard. The analysis of these data is in progress.

A comparison of attenuation values measured by ANSI S3.19 (current standard) and ANSI Z24.22 was completed on the SPH-4 helmets, DH-132 helmets, and five other types of hearing protectors. A report describing the differences is in progress.

The effects of chemical defense (CD) masks and oxygen masks on the speech intelligibility and real-ear attenuation characteristics of the SPH-4 helmet were investigated. All the masks degraded the intelligibility of the SPH-4 when worn by the listener. The masks

included in the sample had varying effects on speech intelligibility when worn by the speaker. The real-ear attenuation of the SPH-4 was degraded by two of the CD masks because the retention straps interrupted the ear seal-to-head interface, causing acoustic leaks. Minor redesign should correct this problem.

A study was conducted to determine the extent of hearing loss among aviators at Fort Rucker, AL, and to identify factors which may have contributed to this loss. This study included aviators with as few as 50 to as many as 7,000 flight hours. Preliminary results indicate validation of the findings of a similar study conducted in 1970. When validated for the overall Army aviator population, these results will provide longitudinal windows that will serve as indicators of individual susceptibility.

PUBLICATIONS:

Prototype Testing of the Integrated Helmet Unit for the Integrated Helmet and Display Sighting System, USAARL Letter Report 82-6-2-1.

Comparative Evaluation of SPH-4 Helmets from DLA 100-80-C-2226 and DLA 100-780-1041, USAARL Report 82-4.

PRESENTATIONS:

Comparison Methods Used to Determine Sound Attenuation Characteristics of Hearing Protective Devices, Acoustical Society of America, Apr 82.

DD 1498

The above work has been conducted under Research and Technology Work Unit Summary.

Medical Assessment of Hearing Protective Devices, DAOB 6886, 135.

Contributing Work

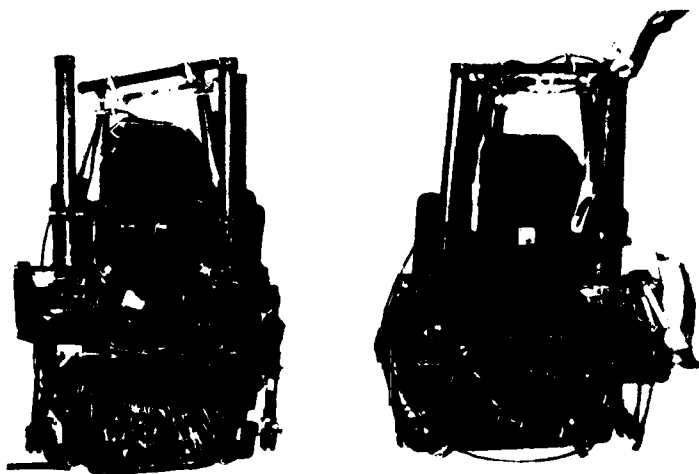
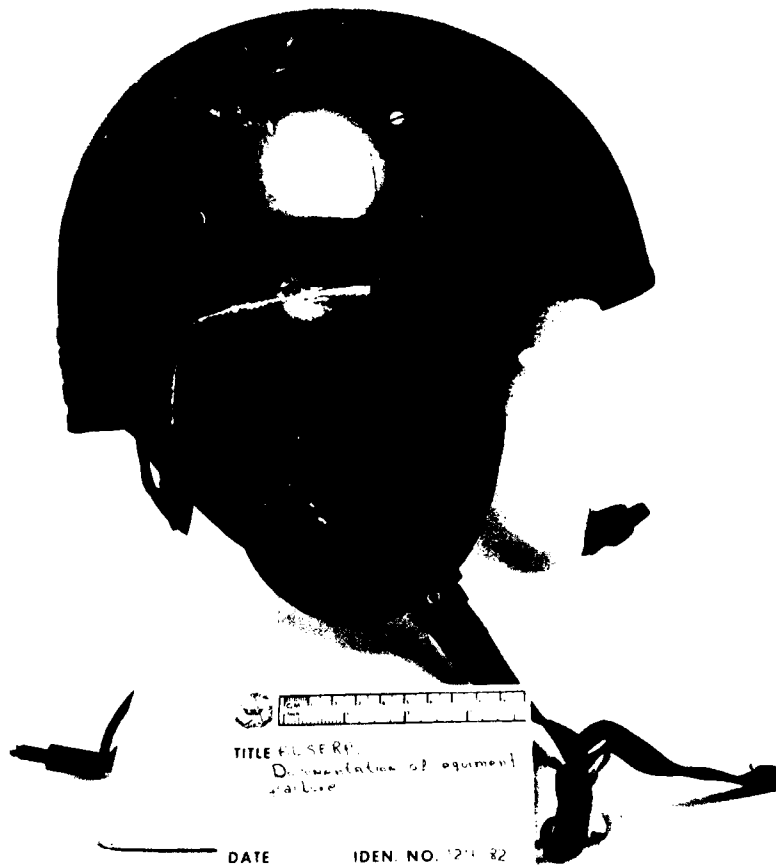
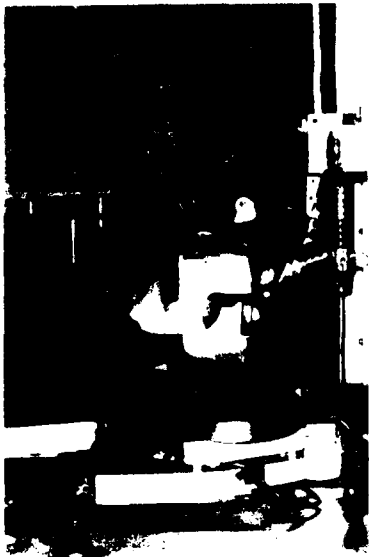
Work done under the following contracts and customer-funded projects contributed to this research program.

Crushable Earcup Development.

Combat Vehicle Crewman (CVC) Helmet Impact and Acoustical Evaluation.

Effects of Hearing Protectors on Human Auditory Localization.

Hearing Protection Against Low Frequency Weapons Noise.



Impact Biodynamics of Crashworthiness & Personnel Armor Program

Background The inevitable result of man's use of vehicles throughout history has been impact injuries caused by crashes of vehicles. Since crashes cannot be totally eliminated, vehicles have been designed increasingly to be more "crashworthy." The term "crashworthiness" is used similarly to the term "airworthiness" in aviation: airworthy means worthy to fly or "fit and safe to fly" and crashworthy means worthy to crash! Airworthy sciences have been developing since the Wright brothers first flew, but crashworthy sciences have developed only since WWII. Crashworthy improvements are still needed in aircraft as revealed by statistics showing fatality rates little improved in the last 20 years. The performance of existing life support equipment in aircraft must be known prior to stating new crashworthy design criteria. Once the hazards are identified, methods to eliminate them can be developed.

In the past, USAARL has been primarily involved in the analysis of injuries seen in aircraft accidents under the auspices of the Aviation Life Support Equipment Retrieval Program (ALSERP), in which all equipment involved in the cause or mitigation of injury is sent to USAARL. In the past year, however, the scope of this work has been expanded to include parachute impact in high airspeed jumps, chest armor impact from .50 caliber bullet deflect, tank gunner brow pad impacts, and motorcycle helmet impacts.

Objective To identify impact injury mechanisms of U.S. Army fliers via standard epidemiological techniques, and to correlate the injury to the input energy, so that design and test criteria may be provided for helmets, restraint systems, parachutes, and personnel-armor padding.

Progress Through on-site investigation, laboratory analysis, and the ALSERP, progress was made toward the goal of providing equipment performance information and future equipment design criteria. All major accidents involving UH-60 helicopter life support equipment (LSE) were investigated in order to assess the effectiveness of the seats, padding, helmets, and other LSE in these new "crashworthy" aircraft. The significant findings from UH-60 investigations (good pilot seat performance and poor troop seat performance) were presented at a Blackhawk Crashworthiness Conference

sponsored jointly by the U.S. Army Safety Center and USAARL. Many of the improvements recommended at this conference are currently being implemented.

An evaluation report covering damaged flight helmets retrieved from 1972 through 1981 under ALSERP was completed in draft form. In addition, separate studies relating to various aspects of head and spinal column injury in aviation accidents have been drafted.

A questionnaire relating to back pain in 800 helicopter pilots has been completed and the data are being analyzed. A related pilot project was conducted on the USAARL vibration simulator to determine the relative effects of vibration and posture on the occurrence of back pain.

Continued effort has been expended on the evaluation of various "crushable" foams and helmet shell combinations, and a final report is being written. Additional impact test data have been provided to the Integrated Flight Helmet Program Manager. A total of 15 impact tests with human surrogates on new "crushable" earcups was completed. The impact tests of UH-60 Blackhawk crew seats under a tri-service contract at Wayne State University have been completed, and the results are being analyzed. Evaluations of crash-damaged seats, restraints, and helmets continued.

Plans for the construction of a .50 caliber firing facility have been completed; the facility is to be used for .50 caliber armor vest evaluations. The Staged Personnel Parachute System Test Plan was reviewed, and test recommendations made to the U.S. Army Test and Evaluation Command (TECOM). Test components were received and assembled to conduct helmet retention tests for the U.S. Navy in FY 83. Instrumentation and personnel were provided to the U.S. Army Human Engineering Laboratory to determine the tolerance of tank gunners to muzzle brake impact from large-bore weapons on ultra-light tanks; a draft report on this work was completed. Comparative impact and retention tests were conducted on two prototype motorcycle helmets for the Armor Command and the results were transmitted to the project officer at the U.S. Army Armor Center.

PUBLICATIONS: *Analysis of U.S. Army Aviation Mishap Injury Patterns*,
(Reprint). USAARL RPT 82-2.

PRESENTATIONS: *Analysis of U.S. Army Aviation Mishap AGARD Injury Patterns, and Impact Protection in Helicopters, Design Specifications Versus Performance*, presented to NATO/AGARD Specialists' Meeting on Impact Injury Caused by Linear Acceleration: Mechanisms, Prevention and Cost, Apr 82.

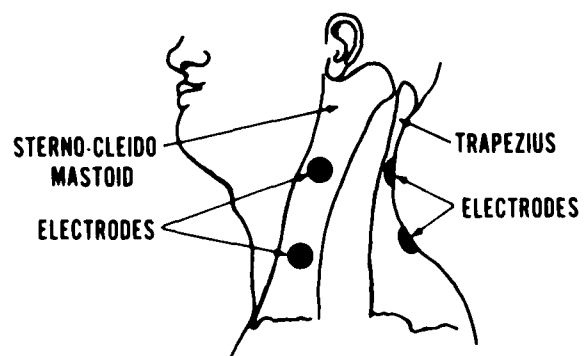
DD 1498 The above work was conducted under Research
and Technology Work Unit Summaries.

Biodynamics of Life Support Equipment and Personnel Armor,
DAOG 0167, 131.

Biodynamics of Impact Physiology, DAOD 6735, 137.



ELECTRODE PLACEMENT



Vibration Hazards of Combat Vehicles Program

Background

This program was initiated to study the effects of vibration on musculoskeletal disorders in Army aviators. Since unique vibration exposures are present in each emerging vehicular weapon system, the program has been expanded to cover all types of vehicles as well as aircraft. The long-term goal of the vibration program is the development of vibration tolerance limits as a function of amplitude, frequency, and exposure time for use as criteria for vehicle development.

Objective

To conduct multidisciplinary basic and applied biomedical engineering research to (a) record and characterize the field environment of vibration, (b) duplicate the field environment in the laboratory to study effects on human health and performance, (c) develop a scientific data base of pertinent medical and performance-related information, (d) determine short-term and cumulative biomedical effects of vibration on the musculoskeletal system and develop technological methods by which to reduce these effects, and (e) evaluate and develop medical and performance-based criteria on human vibration tolerance.

Progress

A subjective low back pain assessment of U.S. Army aviators was completed. Data trends indicated that helicopter seating posture affected low back pain. The effects of whole-body random vibration on visual performance as a function of observer ocular characteristics were studied. A protocol for measuring in-flight neck muscle stress as a function of helmet weight and center of gravity was developed.

Under a University of Miami contract, research on the effects of helicopter control handle vibration in the vertical axis was completed. At frequencies less than 50 Hz, the pilot's ability to track targets was affected by pulse shape (random or sinusoidal) and by frequency. Low-frequency sinusoidal vibration produced synchronization of neuromuscular activity and significantly reduced tracking performance.

A Wright State University contract showed the isometric strength of the neck muscles to be least laterally. The variation of neck muscle stress caused by 27 permutations of helmet weight and center of gravity values was measured with EMG recordings of volunteers' neck muscles. The EMG data are being reduced, and a report is in preparation. A multiple linear regression mathematical model is under consideration so that EMG shift can be predicted as a function of helmet mass distribution for future designs.

PRESENTATIONS: *Effects of U.S. Army Headgear on Neck Muscle Loading and Fatigue*, presented at Army Aeromedical Concepts Review Committee (AACRC) Conference, Feb 82.

DD 1498 The above work was conducted under Research and Technology Work Unit Summary.

Vibration Hazards of Combat Aircraft and Vehicles, DAOG 6100, 152.

Contributing Work Work conducted under the following contracts contributed to the research objectives of this program.

Effects of U.S. Army Headgear on Neck Muscle Loading and Fatigue.

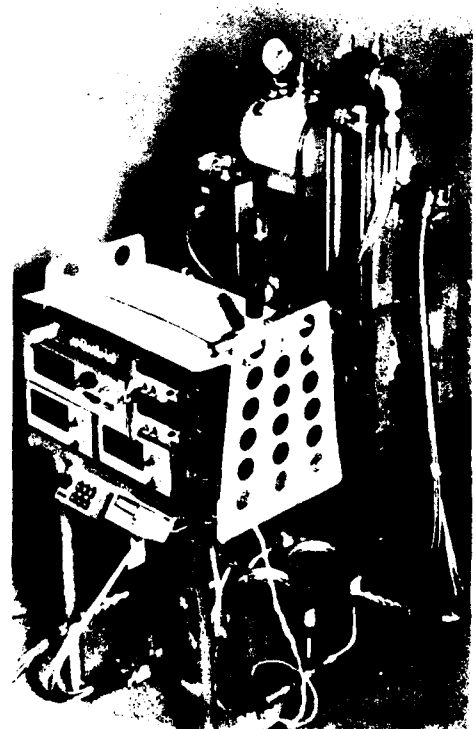
Study of Vibration Effects of Muscular Performance.

Crew Life Support Systems Biotechnology Program

Background Modern warfare is predicated on the use of an ever increasing variety of technologically advanced weapons, transport and communication systems. Couple this trend with doctrine which emphasizes round-the-clock sustained operations and there exists the potential for a devastating conflict. On the one hand, the advanced technology and new tactics give our troops an edge in any potential battle. On the other hand, man's inherent physiological, and perhaps psychological, limitations can totally neutralize any such advantage. The Crew Life Support Systems Biotechnology Program is designed to identify, evaluate, and eliminate or prevent the health hazards resulting from the mismatch between the soldier's physiologic needs and the environment resulting from use of new equipment, weapons, and tactics.

Specifically, current focus is on maintaining aviators in the proper state of oxygenation under all flight conditions and on minimizing the deleterious effects of wearing chemical protective ensembles while conducting aviation operations and training. Short-range goals are (1) to evaluate the concept of using pressure swing molecular-sieve technology to produce clean breathable oxygen-enriched air to alleviate all levels of hypoxia, and (2) to evaluate current and proposed chemical defense ensembles in the flight environment to ascertain how long aviators can fly effectively without succumbing to heat stress or other stressors imposed by these basically cumbersome protective systems. Long-range goals call for collection of extensive data bases relating physiologic response to environmental stressors from which computer models can be developed which will assist in optimizing life support systems design.

Objective The Crew Life Support Systems Biotechnology Program is designed to identify, assess and prevent unnecessary health hazards imposed by exposure to the operational environment, toxic gases, varying oxygen levels, chemical and biological agents and antidotes or other drugs; to provide the Army technical information, recommendations and standards to be used in the development and modification of systems that provide protection from those hazards; and to develop a data base identifying and quantifying the physiological and medical impact of life support equipment on mission accomplishment. This program also is designed to identify and elucidate problems associated with life support equipment and to develop computer models



based on analytic and empirical data to facilitate the conceptualization and development of design criteria for improved life support equipment.

Progress

Data were collected and analyzed on the operation of two Onboard Oxygen Generation Systems (OBOGS) in the UH-1H rotary wing and U-21 fixed wing turboprop aircraft. Results are being written for publication. A laboratory prototype of an OBOGS unit was built to assess the ability of this technology to act as a filter to protect the aviator from battlefield contaminants. A revised protocol has been written to determine the oxygen requirements of helicopter pilots during different flight regimens, and instrumentation for this effort has been procured.

A protocol entitled "Physiological Assessment of the Aircrew Chemical Defense Ensemble" was implemented in FY 81. Phases I and II in which aviators flew prescribed maneuvers while wearing current and proposed chemical defense (CD) ensembles were conducted in FY 81. Physiological, psychomotor, and performance data were collected in FY 81 and were analyzed in FY 82. Results were presented at the Tri-service Aeromedical Research Panel Meeting, the US Army Medical Research and Development Command Chemical Defense Bioscience Review, the Fort Rucker NBC Working Committee, and the Army Aeromedical Concepts Review Committee. A report, "Physiological Impact of Wearing Aircrew Chemical Defense Protective Ensemble While Flying the UH-1H in Hot Weather," is in final draft.

Team members have been active in many meetings to discuss and plan for design, test, and evaluation of the Aviation Life Support Equipment Systems for the Integrated Battlefield (ALSSIB), for evaluation of a USAF-sponsored second generation chemical defense ensemble, and for studies of antidotes as they affect pilot performance.

As part of the program to assess pulmonary function in the operational environment, a survey of 360 active duty aviators was started with some 105 subjects completed by the end of FY 82. Draft report of preliminary findings is in final typing.

Computer modeling was begun with the transfer of BRNSIM, a burn simulation model, from the PDP 11/40 at LSU School of Medicine to our in-house PDP 11/03. During FY 83, three other models should become operational: RESPIRO, an automated analysis of the forced expiratory spirogram with English language diagnosis; MACPUF, a respiratory system simulation model; and HEAT, a heat stress model. A review of 12-14 years of work in the "Human Response to Fire" was presented in the NATO/AGARD Lecture Series 123 in June 1982.

A laboratory study of oxygen masks (British P/Q and US MBU 12F) was completed and a draft report prepared.

PUBLICATIONS:

Survey for Toxic Contaminants in the BLACKHAWK Helicopter During HELLFIRE Missile Launches, USAARL LR 82-7-3-1.

PRESENTATIONS:

Physiological Assessment of the Aircrew Chemical Defense Ensemble, presented to the Tri-Service Aeromedical Research Panel, Oct 81.

Evaluation of Two Molecular Sieve Oxygen Generators in US Army Fixed and Rotary Wing Aircraft. Proceedings of symposium *Advanced Aircraft Oxygen Systems*, Vol III Working Party 61 ASCC 22d Meeting, Nov 81.

Improvements of Aircraft Oxygen Systems Intentions of ASCC Air Forces. US Army proceedings of symposium *Advanced Aircraft Oxygen Systems*, Nov 81.

Physiological Assessment of the Aircrew Chemical Defense Ensemble, presented to the USAF Test Plan Working Group, 2d Generation Chemical Warfare Defense Ensembles, Nov 81.

Physiological Assessment of the Aircrew Chemical Defense Ensemble, presented to the NBC Working Committee, Jan 82.

Concept Evaluation of Molecular Sieve Oxygen Generation Systems for Use Onboard Army Aircraft, presented to Army Aeromedical Concepts Review Committee Conference, Feb 82.

Physiologic Responses of Army Aviators Wearing Chemical Defense Ensembles in Flight During Hot Weather, presented to Army Aeromedical Concepts Review Committee Conference, Feb 82.

Biomedical and Health Hazard Assessment of Oxygen Enrichment Breathing Systems, presented to the Manpower Survey Team, Feb 82.

Research Countermeasures for Significant Medical Hazards in Military Systems, presented to the Manpower Survey Team, Feb 82.

Physiologic Response of Army Aviators Wearing Chemical Defense Ensembles in Flight During Hot Weather, presented to Chemical Defense Bioscience Review, Apr 82.

Physiological Assessment of the Aircrew Chemical Defense Ensemble, presented to Aeromedical Problems Course, Apr 82.

USAARL's Program for Chemical Defense Research, presented to Chemical and Biological Task Force, May 82.

Human Response to Fire. Lecture Series No.
123 Aircraft Fire Safety, 1982 June; France.
NATO/AGARD.

DD 1498 The above work was conducted under Research and
Technology Work Unit Summaries:

Biomedical Application and Health Hazard Assessment of
Oxygen Enrichment Breathing Systems, DAOG 0169, 134.

Research Countermeasures for Significant Medical Hazards
in Military Systems, DAOG 0165, 133.

Development of Military/ASTM Standard Method for Rapid
Assessment of Burn Hazard, DAOH 0152, 291

Cardiopulmonary Physiology in Army Aviators, DAOG 1505,
279.

Contributing Work Work conducted under one customer-funded
project contributed to the research objectives of this program.

Survey for Toxic Contaminants in the BLACKHAWK Helicopter
During HELLFIRE Missile Launches.

Combat Crew Effectiveness Research Area

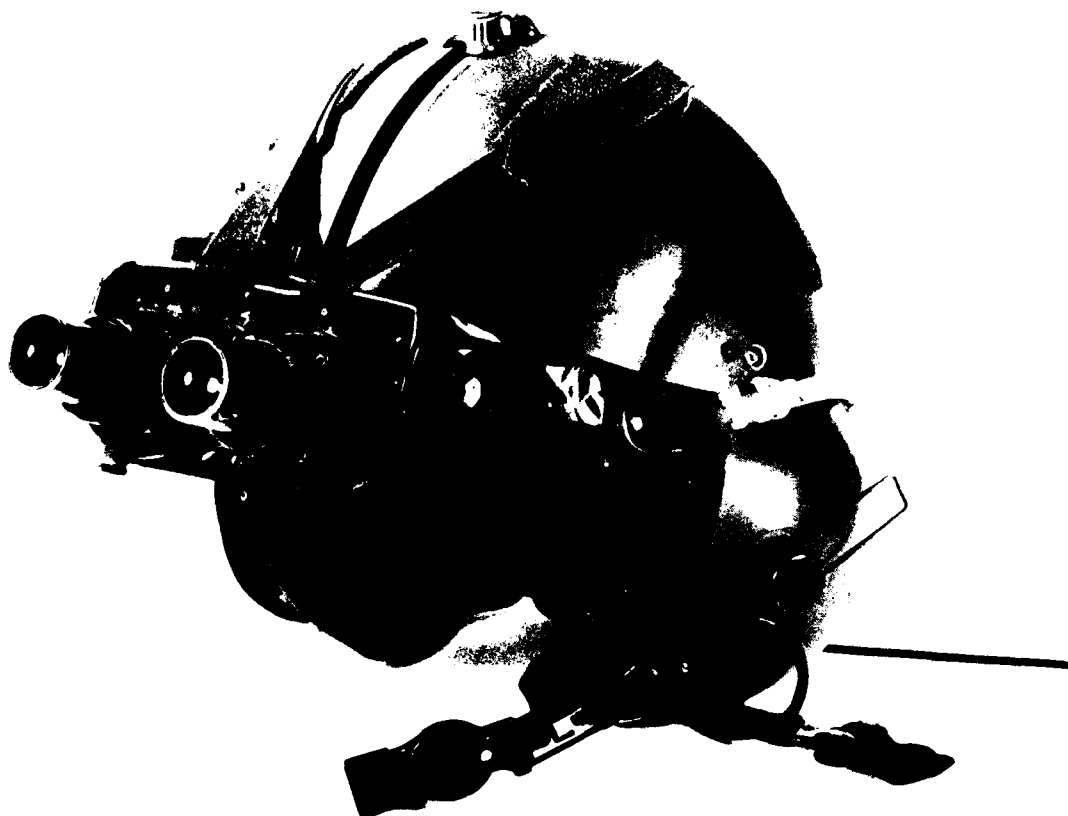
This project area encompasses research programs which are directed toward the delineation and study of behavioral, psychological, physiological, and performance requirements imposed by military operations, environments, and special equipment. The purpose of this work is to prevent casualties by assessing factors which serve to increase the soldier's vulnerability to the stressors of a combat environment. Inadequate training, indoctrination, physical conditioning, as well as high stress loads imposed by the rigors of the combat environment all potentially impact on the soldier during operational missions. Further factors, such as excessive heat and cold and complex and sustained work requirements, may overload the soldier and exceed human tolerance in life-threatening situations.

Physiological and psychological investigations are conducted to identify environmental and operational stressors, and to provide data on the cost/pay-off relationship between such stressors and soldier tolerance, sustainability, and survivability.

Efforts include, but are not limited to, medical indices of crew workload and fatigue; soldier selection and physical fitness; and biomedical aspects of heat, cold, and altitude on human functioning as well as those soldier factors affecting performance and survivability under conditions of sustained and chemical operations.

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Sensory Limitations of Man/Machine Systems Program

Background

The extreme lethality of the modern mid-to-high-intensity battlefield is forcing changes in tactics, weapons, and personal protective equipment. Advancing weapons technology along with doctrinal requirements for continuous operations (including nighttime operations) combine to produce stresses which threaten to exceed the capabilities and limitations of the human operator and thereby degrade crew performance. For example, the visual demands of night vision goggles may necessitate new visual selection and retention criteria, and the requirement for continuous operations may exceed the soldier's visual performance capabilities after extended periods of operation. The use of protective devices such as anti-laser goggles, the sun, wind and dust goggles, and helmet visors threatens to disrupt the crewmember's visual performance.

The doctrinal requirement for around-the-clock combat operations results in special concerns about the human operator's capabilities to function effectively in darkness. Red lighting has been used in Army aircraft cockpits since pre-World War II days because of its ability to preserve nighttime visual sensitivity. However, in future aircraft blue-green lighting will be required in order to achieve compatibility with aviator night vision goggles. This may compromise flight capabilities with unaided vision. The existing biomedical data base regarding the visual performance effects of vibration, darkness, night vision goggles, protective goggles, and similar stressors is inadequate for countering the potential threats to combat effectiveness. The nature, extent, and mechanisms of visual performance degradation are largely undefined, and the resulting impact on combat effectiveness has not been determined.

The overall goal of this research program is the development of realistic measures to prevent compromised combat effectiveness due to impaired visual performance. These preventive measures will include exposure criteria, material design criteria, crew selection and retention criteria, and modified operational doctrine. A major intermediate goal is the establishment of a visual effects biomedical data base sufficient to support development of such measures.

Objective

The major technical objectives of this research program include identification of the parameters of visual functioning which are degraded by vibration, darkness, body position, protective devices, night vision goggles, fatigue, and spectral characteristics of lighting. Characterization and quantification of visual degradations produced by specific stress factors, identification and characterization of mechanisms underlying visual degradations, determination of the relationships between identified visual degradations and task performance, and development and validation of models for predicting the impact of specific visual degradations on combat effectiveness are major technical objectives. Also, included as objectives are development and validation of exposure criteria and/or material design criteria for selected stress factors, development and validation of selection/retention criteria and operational protective measures for selected stress factors, and development of instrumentation for rapid, reliable measurement of selected visual performance parameters.

Progress

A modified faceplate for the AN/PVS-5, Night Vision Goggle (NVG), was conceived, designed, and evaluated. This design allows unaided vision for the lateral and lower viewing fields, color discrimination of aircraft and ground lights, map reading, spectacle wear, reduced lens fogging, and improved comfort. Approximately 50 NVG qualified aviators evaluated and strongly preferred the modified NVG over the standard AN/PVS-5. Approval for worldwide use of the modified faceplate is pending.

A lanthanum-modified lead zirconate titanate (PLET) goggle, EEU-2/P, was evaluated with flights in various Army helicopters. Parameters of operation included day and night flights with weapons fire. Three problem areas with the PLET were identified: (1) viewing towards the sun through the rotor blades would trigger the device; (2) if the PLET were triggered when viewing inside the cockpit, the automatic goggle transmission control overreacted for the brighter outside luminous condition, reducing light transmission through the goggle to an unsafe level for flight; (3) the clearest state of the PLET goggle is equivalent to normal sunglasses, making unaided night operations difficult.

A study was performed comparing depth perception under three different conditions: daytime, nighttime, and nighttime using night vision goggles. Judgments were made at distances from 200 to 2000 feet with the observer estimating when a moving target was lined up with a stationary one. It was found that the best performance was in the daytime and that during nighttime, even under conditions of full moon illumination, depth perception was better with the goggles than with the unaided eye.

An operational study of the effects of red versus blue cockpit lighting upon dark adaptation was undertaken. A special portable computer controlled adaptometer was constructed for this study. The aircraft was equipped with both red and blue cockpit lighting systems. Threshold data are now being collected under actual flying conditions.

The effect of whole-body random vibration on visual performance was assessed in aviator candidates with minor astigmatic or oculomotor anomalies. In comparison with highly selected normals, astigmatism showed high decrements under vibration while eso- or exophorias showed minor decrements.

In support of the Advanced Attack Helicopter Program, a mathematical analysis of dynamic image degradation occurring in CRTs as a result of the interaction between the target/sensor relative velocity, the CRT system scan rate, and the persistence of the display phosphor was developed.

Optical testing was performed on the Integrated Helmet and Display Sighting System for the Advanced Attack Helicopter Program Manager's Office. In addition, medical evaluation of the visual and optical properties of a commercial spectacle, trade name, Gargoyles, was conducted at the request of the US Army Medical Research and Development Command.

PUBLICATIONS:

Direct and Neighboring Sensitivity Changes Produced by Red and Blue-White Adapting Fields, USAARL RPT 82-1.

Comparative Evaluation of JTB-4 Adaptive Field, DLA 100-44-1-1100 and DLA 100-44-1-1 42, USAARL RPT 82-4.

Conclusions from the Visual Adaptation Studies, USAARL RPT 82-5.

Color Acuity-Field Size Relationship, Human Factors Laboratory, USAARL RPT 82-10.

Integration of the Visual Adaptation Studies with the Integrated Visual Display System, USAARL LR-82-6-2-1.

Analysis of Image Motion in AT-10 Type 1. Min. Acad. Sci., V 55:58, 1982.

PRESENTATIONS:

1. "The Effect of Visual Impairment on Pilot Performance," Aerospace Medical Association, May 82.

2. "The Effect of Visual Impairment on Pilot Performance," Aerospace Medical Association, May 82.

3. "The Effect of Visual Impairment on Pilot Performance," Aerospace Medical Association, May 82.

4. "The Effect of Visual Impairment on Pilot Performance," Aerospace Medical Association, May 82.

5. "The Effect of Visual Impairment on Pilot Performance," Alabama Academy of Science, 59th Annual Meeting, Birmingham, AL, Mar 82.

DD 1498 The above work was conducted under Research and Technology Work Unit Summary.

Military Visual Problems: Assessment, Mechanisms, and Protection, DAQB 6893, 164.

Contributing Work Work conducted under two customer-funded projects contributed to the research objectives of this program.

Feasibility of Using PLZT Goggles in Helicopters.

Concept Evaluation Program Test of the Program for the Pilot Night Vision System in a Surrogate Aircraft.

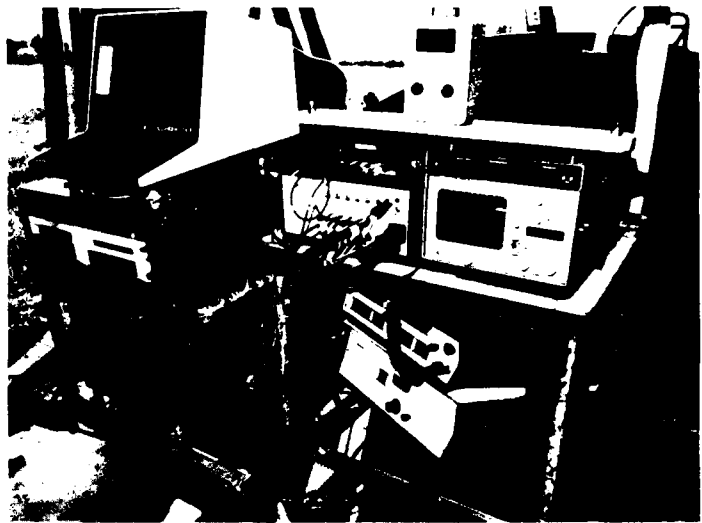
Biomedical Aspects of Crew Workload, Selection & Staffing Program

Background Identifying, defining, and quantifying man's physical requirements, task demands, and biomedical limitations associated with various systems and technology become critical for the optimal design of equipment, prediction of performance criteria, and development of biomedical models. Military developers, planners, and specialists at every level must be aware of the unique hazards generated by Army systems and technology, and that these hazards are further elevated by the adverse environment of the Army tactical operations in which the soldier is required to function.

Army aviation, with its highly sophisticated airborne systems, represents a prime example of a military operational area that lacks complete parametric research to develop empirical criteria for ideal man-machine interface and analytical tolerance/survivability/capability envelopes within which the selected aircrew will be forced to work and endure. A more complete biometric data base is not available to describe and quantify pilots' physiological and psychological tolerance to operational stressors, military hardware, advanced tactics, and progressive military operations.

USAARL's research program is designed to establish/update aircrew selection criteria, evaluate requirements for optimum man-machine interface, and provide physiological and psychological guidelines describing and quantifying tolerance survivability and capability envelopes of man within the military flight environment. The long-range goals of this research are to establish extensive biomedical data bases and predictive models to reduce or eliminate aviators' impaired performance; sensory, cognitive, and physical overload; combat stresses; and, in general, hazards inherent in Army systems and in the Army environment.

Objective The objective of this research program is to develop standards for aeromedical hazard definition and to postulate hazard definitions based upon field assessment of combat operations, including systems and environmental effects.



Extension of the data base regarding the visual performance abilities of fixed and rotary wing aviators during various tactical missions, with special emphasis on the quantification and interpretation of these data, on their relation to variables, such as pilot physiological and psychological states, and on tactical decision making, is one of the objective of this program. Further efforts include determining decision requirements processing limitations, and developing predictive models identifying cognitive capabilities and workload criteria incurred by highly sophisticated aircraft technology within a combat environment, defining and quantifying aviator psychomotor performance and tolerance/survivability capabilities envelope, and correlating the results of the above visual, mental, and psychomotor processes with the biomedical parameters affecting aviation personnel during sustained military operations.

Progress

A request was received from the Commander, US Air Aviation Center, Fort Rucker, to evaluate a purported crew stress or workload problem among instructor pilots in a flight training environment. Field interviews, questionnaires, and task component simulation data were collected from 200 instructor pilots. The final results were documented and presented to the requesting command.

The visual research effort included the completion of the joint laboratory research for the US Coast Guard regarding scan behavior of search and rescue observers. Additionally, visual data were submitted to preliminary analysis in an attempt to define and quantify visual search strategy and performance during maximum inflight visual workload tasking.

Cognitive workload assessment was initiated in an attempt to delineate the effect of stress and workload on the pilot's cognitive process. Heat stress during the wearing of chemical defense (CD) ensemble was the independent variable for the first data analysis. Efforts are directed toward evaluating the methodology considerations, test-retest validity, and sensitivity of the current test procedures. Performance and psychomotor data were collected, analyzed, and reported on the effects of heat stress while wearing chemical defense ensembles. Current efforts in this area include the completion of data analyses to determine the effects of sustained night vision goggle missions on safe aircraft operations.

Four technical reports and 11 presentations have been provided to the scientific aviation and medical community summarizing the results and findings of the year's research effort.

PUBLICATIONS:

Turnout for Tracking Performance in Simulation with Extended Flight Operations in a Helicopter Simulator, USAARL RPT 82-6.

Preliminary Study on Scanning Techniques Used by US Coast Guard Lookouts During Search and Rescue Missions, USAARL RPT 82-7.

Comparison of Helicopter Copilot Workload While Using Three Navigation Systems During Day-or-Night-Flight, USAARL RPT 82-8.

Performance Impact of Current United States and United Kingdom Aircrew Chemical Defense Equipment, USAARL RPT 82-9.

PRESENTATIONS:

Preliminary Study on Scanning Techniques Used by US Coast Guard Lookouts During Search and Rescue Missions, presented to US Coast Guard Research and Development Center, Nov 81.

Laboratory Overview, presented to University of Illinois, Jan 82.

Aircrew Stress and Workload, presented to University of Illinois, Jan 82.

Night Vision Goggles and Sustained Operations, presented to Army Aeromedical Concepts Review Committee Conference, Feb 82.

Introduction to Fatigue Factors, presented at Aeromedical Concepts Review Committee Conference, Feb 82.

Psychological Effects of Wearing Chemical Defense Ensembles in Flight, presented at Army Aeromedical Concepts Review Committee Conference, Feb 82.

Parametric Multimodal Workload Assessment in Aircraft Guidance Systems, presented to the Manpower Survey Team, Feb 82.

Visual Performance Research Related to Operational Problems in Army Aviation, presented to the Manpower Survey Team, Feb 82.

Biomedical Parameters Affecting Aircrew Workload During Sustained Operations, presented to the Manpower Survey Team, Feb 82.

Operationally Significant Problems in Army Aviation, presented to the Manpower Survey Team, Feb 82.

Preliminary Assessment of Instructor Pilot Stress/Fatigue as a Function of Student Fatigue and Cyclic Schedules, presented to Commanding General, BS Army Aviation Center, Jun 82.

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The above work was conducted under Research and Technology Work Unit Summaries:

Research Directed at Biomedical Parameters Affecting Aircrew Workload During Sustained Operations, DAOG 0153, 161.

Visual Performance Research Related to Operational Problems in Army Aviation, DAOG 0156, 162.

Parametric, Multimodal Workload Assessment in Aircraft Guidance Systems, DAOG 0101, 163.

Aeromedical Research of Operationally Significant Problems in the Army Aviation Environment, DAOG 0151, 165.

Contributing Work

Work conducted under two customer-funded and one contract project contributed to the research objectives of this program.

US Coast Guard Scan Behavior During Search and Rescue Operations

Night Vision Goggles Attitude Display Concept Evaluation Program

Statistical Analysis of Visual Performance of Helicopter Pilots During Instrument Flight on Repeated Flight



Anthropometry and Ergonomics Program: Criteria for Army Aviators

Background

With the emphasis upon incorporating females into the U.S. Army, there came the increasing realization that empirically-based criteria to guide the selection of personnel did not exist. For those seeking entrance into the Army aviation program, the criteria have traditionally been based on the 5th-95th percentile male. To rectify this circumstance, the laboratory embarked upon a major research effort to develop empirically-based selection standards to assure that an effective aviator-cockpit interface exists for each of the aircraft in the present Army inventory. The research program will address both reach-related and strength-related factors. Without such an effort, aviator selection criteria will remain at odds with existing Army aircraft configurations and Army aircraft manufacturing and design guidelines, and will perpetuate the likelihood that the full operational potential of our existing and future aviation resources will not be realized.

Objective

The objective is to establish anthropometric size, strength, and weight criteria for Army aviators.

Progress

Data pertaining to the cockpit referenced seated eye position of rated Army aviators have been obtained for the following U.S. Army rotary wing aircraft: AH-1S, CH-47C, OH-58C, TH-55, UH-1H, and UH-60A. A microprocessor controlled data collection system and graphics display and a set of computer-controllable variable force loading helicopter controls have been acquired for the purpose of evaluating flight-related performance of small, medium, and large males and females as a function of variation in control force resistance. A largely automated means of collecting data from samples of small, medium, and large male and female subjects performing maximal isometric arm and leg exertions upon helicopter controls in the presence and absence of vibration has been fabricated. Similarly, an automated means of collecting performance-related data on brief, dynamic, force-loaded tasks has also been developed for these same populations. Strain-gauge instrumented controls for the UH-1H have been designed and fabricated for use in determining the input force requirements existing during the execution of emergency maneuvers (i.e., as required in the event of failure of the hydraulics-assist mechanism).

DD1498

The above work was conducted under the following Research and Technology Work Unit Summary.

Anthropometric Criteria for Army Aviators, DAOG 6102, 166.

Soldier Chemical Warfare Agent Antidote Research Area

The overall objective of this program element is establishment of the technology base required to develop safe and efficacious prophylaxis, pretreatment compounds, antidotes, therapeutics, patient decontamination, and medical management necessary to assure individual protection, rapid return to duty, and militarily effective soldier performance on a CW battlefield. This will require development of (a) medical concepts and technologies, (b) pharmacologic, medical, and resuscitative materiel, and (c) resources and systems for prevention, decontamination, handling, treatment, evacuation, and management of CW agent casualties. Emphasis is placed on development of antidotes that will assure soldier protection against the primary threat CW agents.

Antidote & Antidote/Agent Effects on the Visual System Program

Background The chemical warfare (CW) capabilities of the Warsaw Pact pose a real threat for potential mass casualties that could at the very least compromise unit effectiveness. Serious deficiencies in the existing protective capabilities include the lack of CW agent prophylaxes, an incomplete spectrum of antidotes, and antidotes with operationally compromising side-effects. The urgent DOD requirement to develop prophylaxes, pretreatment compounds and antidotes, and the necessary concepts for their use in the medical management of CW casualties cannot be accomplished through the utilization of currently available information and technology. We do not know the mechanisms of action for the current CW agents or their suspected antidotes or possible prophylactic compounds. And there is even less information regarding the combination of the three.

CW agents, especially the nerve agents (organophosphates), have diverse toxic effects on both the central and peripheral nervous systems. Many of the central and peripheral toxicities consist of disruptions of neural functions related to the action of organophosphates on neural transmission in the cholinergic system, where acetylcholine is the known neurotransmitter. We know that acetylcholine is important in control of pupil size as well as the processing of visual information by the retina. It may also be important at more central visual locations. However, neurotransmitters other than acetylcholine may also be involved and contribute to organophosphate-induced neurotoxicity.

In any battlefield situation, the soldier's capability to perform visual tasks is critical for completion of the mission. With widespread use of CW agents, the survival of the unit, as well as the individual, may depend on visual capabilities. Consequently, the Army's effort to develop antidotes, pretreatments, and prophylactics require valid information on the effects of these compounds on visual functions. The primary objective of this research program is to develop a comprehensive biomedical data base on the effects of selected nerve agents, candidate antidotes, possible prophylactic compounds, or combinations of the three on the retina and higher visual centers. Animal models will be selected or developed to enable inferences regarding effects on the human visual system of various



agent/antidote/prophylactic compound combinations. Ultimately, methods will be developed to predict how well a soldier will be able to visually complete his mission following a specified exposure.

Objective The following technical objectives are required to achieve the program's goals:

- (1) Characterization of the effects of nerve agents and/or their antidotes or pretreatments on retinal functions by means of acute and chronic animal experiments utilizing neurophysiological techniques. The retinal functions to be evaluated include: light/dark adaptation, relative sensitivities across classes of retinal neurons, spatial-temporal contrast sensitivities, stimulus-response relationships, receptive field properties, and spontaneous activity.
- (2) Quantification of transmission loss along the visual pathway with gross potential neurophysiological recording techniques, and assessment of performance loss due to drug exposure.
- (3) Assessment of cholinergic system interactions with other transmitters in the visual system following drug administration.
- (4) Identification of sites of action and uptake of antidotes and agents within the visual system by means of autoradiography to provide additional information as to the mechanisms of action and the possible occurrence of local pooling of nerve agent.
- (5) Comparison of single cell data with gross potential and anatomical findings to provide an overall picture of visual systems function following antidote/agent insult.
- (6) Development of models and techniques to predict impact on human visual performance and combat effectiveness.

Progress Protocols have been completed and approved and experiments begun on antidote and antidote/agent effects on the visual system. Initial experiments assessing the effect of physostigmine (a carbamate) and DFP (an organophosphate) on the cortical visual evoked potential (VEP) in cats were complicated by the instability of aqueous solutions of physostigmine and DFP. Cholinesterase assays are now being done and enzyme levels correlated with changes in the VEP. Preliminary experiments have suggested reduction of the VEP with physostigmine and some recovery following atropine.

In electrophysiological studies of *Aplysia*, the organophosphate cholinesterase inhibitor and diisopropyl fluorophosphate (DFP), consistently caused a depolarization of the resting membrane potential of extraretinal photoreceptor cells. DFP also caused a consistent decrease in the photoreponse of these cells to nearly half of the

control level. The effect of DFP increased with increasing doses of the drug. No consistent, significant effect of other drugs (physostigmine, atropine, curare, diazepam, or pralidoxime) on the photoresponse could be demonstrated. No protective effect of these drugs to prevent the DFP-induced diminution of photoresponse was observed. These results suggest a direct effect of DFP on the photoreceptor cell membrane.

DD 1498 This work was conducted under two Research and Technology Work Unit Summaries.

Antidote and Antidote/Agent Effects on the Visual System,
DAOG 8599, 381.

Effects of Nerve-Agent Antidotes on the Visual System,
DAOG 1506, 277.

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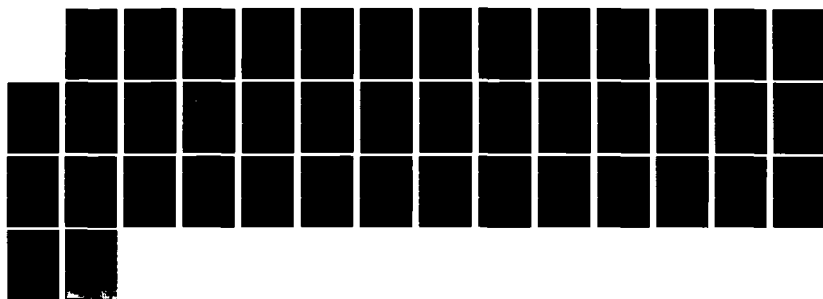
US (UNITED STATES) ARMY AEROMEDICAL RESEARCH LABORATORY
ANNUAL PROGRESS REPORT FY 1982(U) ARMY AEROMEDICAL
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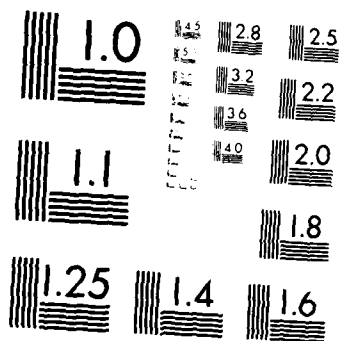
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Technical Participation

Information and Technology Exchange

Participation with the other military services and with international groups in projects of mutual interest benefits us scientifically and economically. There is no problem with which we are involved that does not mesh somehow with that of another group.

Working with interservice and international groups provides for the effective interchange and availability of scientific and technical information needed to support the management and execution of our research program. Membership in and association with these groups further USAARL's technology exchange.

This listing does not include USAARL's long-standing participation in technical, professional, academic, and industrial groups which are described elsewhere in this report.

Air Standardization Coordinating Committee (ASCC) Working Party 61

The Air Standardization Coordinating Committee (ASCC) Working Party 61 is a chartered international military organization of the English-speaking nations which addresses aerospace medicine and life support. Emphasis is placed on standardization, interoperability, and technology exchange. Member nations include the United States, Canada, United Kingdom, Australia, and New Zealand. USAARL provides technical consultants and a principal committee representative to actively participate in the committee's activities and coordinate Army Medical Department (AMEDD) participation. Major Bruce Leibrecht represents the laboratory and Army Aviation Medicine to this group.



International Test Participation Agreements

The ASCC is chartered to negotiate test participation agreements between member nations and military services. These agreements provide for the evaluation, use, test, or review of a specific piece of equipment by another country or service not normally having access to that equipment. The evaluation data may be jointly gathered but, in any event, is shared between countries and published as a formal report in accordance with the terms of the agreement.

UNITED KINGDOM NBC PROTECTIVE CLOTHING ENSEMBLE

In 1977, USAARI entered into a test participation agreement with the Institute of Aviation Medicine, Farnborough, England, to conduct a physiologic assessment of the United Kingdom Aircrew NBC Protective Clothing Ensemble. This study includes field trials and laboratory tests of the visual and acoustic properties of the M5 respirator as well as in-flight biomedical assessment of the entire ensemble's effect on pilot performance and pilot thermal physiology. Aspects of this in-depth study are being conducted in conjunction with the Ergonomics Laboratory at the US Army Research Institute of Environmental Medicine (USARIEM), Natick, MA, and the Crew Biotechnology Branch of the USAF School of Aerospace Medicine, Brooks AFB, TX. Four reports covering various aspects of this study were drafted during FY 82.

NOMEX FLIGHT JACKETS

A second test participation agreement was entered into by USAARI and the Flight Medical Department, Army Aviation, Commonwealth of New Zealand, in 1981. At the 21st meeting of the ASCC WP 61, the Royal New Zealand Air Force (RNZAF) representative requested from the US Army representative that a test participation agreement be established for the purpose of receiving two aviator Nomex flight jackets. The RNZAF desires to test these jackets for comparison purposes with other similar garments. In accordance with this request, the US Army representative procured and provided these jackets in August 1981. This action was accomplished in coordination with the US Air Force.

AGARD--Aerospace Medical Panel

This panel was established in May 1952 and was an early pioneer in AGARD to discharge the mission of bringing together leading personalities of the NATO nations in the fields of science and technology relating to aerospace. The Aerospace Medical Panel (AMP) now is one of nine panels. It is concerned with the exchange of information on

aerospace medical research and development, the operationally oriented requirements of clinical aerospace medicine, the provision of advice in human engineering problems, and the stimulation of new research activities to assist and enhance pilot performance in the demanding aviation environment. The panel has formally chartered subcommittees in the areas of behavioral sciences, biodynamics, special clinical and physiological problems in military aviation, and the special senses.

USAAFL has been an active participant with this panel since 1965. Members of the laboratory serve on AMP subcommittees as technical consultants.

AMP Specialists' Meeting, 'Impact Injury Caused by Linear Acceleration: Mechanisms, Prevention, and Cost,' Cologne, Germany

Eleven years ago, an AGARD Specialists' Meeting was convened in Oporto, Portugal, which brought together experts in linear acceleration effects. In the intervening decade, the need for impact injury protection in NATO aircraft has increased, largely because many NATO aircraft are helicopters in which the only method of emergency escape is a landing under less than ideal conditions. During the 70s, protective research also advanced and a review was deemed highly appropriate. Thus, the AMP convened this follow-on meeting 26-29 April 1982 in Cologne, Germany, to provide an update on this topic.

The meeting covered the following topics: spinal column injuries under compressive, bending, and tensile loads; head/neck injury; injury data collection; injury-preventing hardware; mathematical model verification; and crashworthiness cost effectiveness. The papers presented are currently in the process of publication at AGARD headquarters.

USAAFL played a key developmental role in this meeting. Mr. J. L. Haley, Jr., was the Technical Program Chairman and editor of the publication.

NATO DRG Panel, Research Group 6, Effects of Impulse Noise

Formed in 1978, Canada, France, Germany, the Netherlands, Norway, the United Kingdom, and the United States collect and evaluate data on permanent threshold shifts induced by shooting noise in military practice

from both light and heavy firearms in relation to the noise exposure. The group evaluates methods of measurement of impulse noise and compares the different impulse noise damage risk criteria used by the participating nations. It evaluates the effects of noise induced hearing loss on performance, collects and evaluates data on nonauditory effects, and exchanges information on the applicability of hearing protectors on the effects of hearing protection in military practice.

Dr. Jim Patterson was appointed to membership in this working group in 1980.

NAS-NRC, Committees on Vision and Hearing, Bioacoustics, and Biomechanics

SAARI has been an active participant in the science and technology exchange programs of the National Research Council (NRC) since the mid-to-late 60s. USAARI scientists participate as working members of the various ad hoc and working groups of the acoustics and vision committees. The Army representative to the Committee on Hearing, Bioacoustics, and Biomechanics (CHABA) and the Committee on Vision (COVIS) is a USAARI scientist, MAJ Bruce Leibrecht. Dr. James Patterson, LCD Roger Wiley, Dr. Isaac Behar, LTC John Crosley (Ret.), and Mr. Robert L. Camp participate actively.

Tri-Service Aeromedical Research Panel (TARP)

The Tri-Service Aeromedical Research Panel (TARP), established in 1976 for the purpose of fostering technical exchange, reviewing ongoing joint research programs, making recommendations for future joint research programs, cooperative review of individual programs to avoid duplication, and submitting a recommended course of action to The Surgeon General, has proven to be an effective administrative entity in the DOD research community. The TARP consists of 12 members which include two laboratory representatives from each service; a Surgeon General representative from each service; one representative of the respective Medical Research and Development Commands from each service; and one representative of the Headquarters, Air Force Aerospace Medical Division, or Headquarters, Air Force Systems Command. The TARP has the authority to charter technical working groups (TWG) for the purpose of interacting at the scientific bench level and working on viable interservice cooperative research programs. At present, only one TWG exists. It is in the area of biodynamics and the human effects of vibration, impact, and acceleration. Under the

auspices of this IWG, a joint service, Department of Transportation study to develop a standardized set of algorithms that "indicate" all describe the 50th percentile male has been accomplished with a final report written in 1980. The IWG meets in business sessions twice a year and hosts one extensive technical meeting. The IWG meets informally twice a year and other times as necessary. The IWG will represent Laboratory interests.

Tri-Service Life Support Equipment Retrieval Program

USAARL conducts a tri-service life support equipment retrieval program (LSERP) which brings us crash-damaged helmets, seats, and flight clothing for analysis and study. Helmets are the items most often received from the Air Force and Navy.

Army aviation life support equipment involved in either injury causation or prevention, in the field, is sent to USAARL for biomedical and injury correlation evaluation. The evaluation assesses the effectiveness or deficiencies of the life support equipment through an analysis of the physical condition of the protective devices, the human injury incurred, and the related human dynamics involved in the accident.

Data collected through the LSERP helps identify hazard protection problems associated with the equipment. Also, these data enable us to provide injury reducing design recommendations and health criteria for the improvement of life support equipment. The Navy Medical Department maintains a permanent position for a Navy aerospace physiologist at USAARL to support this program.

Tri-Service and NASA Human Factors Engineering Technical Advisory Group

Because of the diversity of subject matter covered by the human factors engineering discipline, the scope of technical areas addressed by the Technical Advisory Group (TAG) is necessarily broad. In general, human factors engineering (HFE), as defined for the purposes of TAG operation, deals with concepts, data, methodologies, and procedures which are relevant to the development, operation, and maintenance of hardware and software systems. Subject matter subsumes all technologies aimed at understanding and defining the capabilities of human operators and maintainers and insuring the integration of the

human component into the total systems to enhance systems effectiveness. Technologies directed toward improved manpower utilization through selection, classification, and training are included as appropriate.

IAC provides a mechanism for exchange of technical information in the development and application of HHI technology. This group enhances the coordination among government agencies and encourages in-depth technical interaction among subgroups in selected topical areas. IAC assists as required in the preparation and coordination of tri-service documents such as technology coordinating papers and topical reviews.

Army Aeromedical Concepts Review Committee (AACRC)

The Army Aeromedical Concepts Review Committee (AACRC) is a standing committee of the AMEDD for the purpose of collecting and disseminating information relative to aeromedical evacuation concepts, equipment, and techniques, and preparing coordinated AMEDD positions on Army aeromedical evacuation issues. The committee meets formally once a year with representation from the worldwide AMEDD aviation community, Army Reserve, National Guard Bureaus, and DA Deputy Chief of Staff for Operations (DCSOPS), and other agencies as appropriate. USAARL, with a mission that includes aeromedical evacuation equipment development as well as general aviation medicine support that encompasses AMEDD aviation, has a long-standing history of intimate participation in the committee's activities.

Army Life Support Equipment Steering Council

This advisory council was chartered in the mid-1970s by the commanding generals of the US Army Materiel Research and Development Command (DARCOM), and US Army Training and Doctrine Command (TRADOC), the Office of The Army Surgeon General, and Forces Command. This is a review and advisory technical council that insures timely and pertinent technical exchange of information regarding the development, logistics, use, and field problems associated with Army aviation life support equipment. The committee meets on a twice-a-year basis and has proven to be an effective vehicle for maintaining a coordinated flow of technical information regarding life support equipment and supplying the solutions of many technical and administrative life support equipment problems of the Army. USAARL participates as the principal technical consultant to the council and is instrumental in formulating AMEDD positions and policies.

Committees

Committee	Affiliation	Individual
AEROSPACE MEDICAL ASSOCIATION		
Scientific Program Committee	Member	Dr. K. A. Kimball
AMERICAN BURN ASSOCIATION		
Prevention Committee	Member	Dr. F. S. Knox III
FEDERAL LABORATORY CONSORTIUM	Member	Ms. S. H. Bullock
AIR STANDARDIZATION COORDINATING COMMITTEE (INTERNATIONAL)		
Working Party 61 (Aerospace Medicine and Life Support Systems)	Army Representative	MAJ B. C. Leibrecht
AMERICAN NATIONAL STANDARDS INSTITUTE		
Z90.1 Helmet Committee	Member	Mr. J. L. Haley, Jr.
53-62 Working Group on the Effects of Impulse Noise on Man	Member	Dr. J. H. Patterson
Working Group on Real-Ear Attenuation Standards	Member	Dr. J. H. Patterson
DEPARTMENT OF DEFENSE		
Aircrew Station Standardization Panel (Tri-Service)	Member	MAJ F. F. Holly
Joint Service Display Panel Subpanel on Display Devices	Member	Mr. C. F. Rash

Committee	Affiliation	Individual
Military Librarian's Workshop Program Committee	Member	Ms. S. H. Bullock
Group on Specification Problems and Standardization Actions on Audio Devices	Member	Mr. E. T. Camp, Jr.
Helicopter Research Coordinating Panel (Tri-Service)	Member	Dr. K. A. Kimball
Human Factors Engineering Technical Advisory Group (Tri-Service)	Member	Dr. K. A. Kimball
Tri-Service Aeromedical Research Panel (TARP)	Member Member	COL D. R. Price LTC R. W. Wiley
Tri-Service Aerospace Medical Coordination Technical Working Group	Member	Mr. J. L. Haley, Jr.
DEPARTMENT OF THE ARMY		
Advanced Attack Helicopter Alter- nate System Safety Group	Member	MAJ C. E. Duncan
Advanced Attack Helicopter Source Selection Evaluation Board	Member Member	Mr. C. E. Rash Mr. B. T. Mozo
Aircraft Noise, Working Group (MIL-STD-8806)	Member	Mr. R. T. Camp, Jr.
Army Aviation Personnel Requirements for Sustained Operations, Study Advisory Group	Member	Dr. K. A. Kimball
Helicopter Medical Human Factors Engineering and Training/Selection Research Coordination Panel	Member	Dr. K. A. Kimball
USAMRDC Vision and Laser Bioeffects Subcommittee	Member Member	LTC R. W. Wiley MAJ F. F. Holly
Source Selection Board on Ocular Protection Against Laser Hazards	Member	Mr. C. E. Rash
USAMRDC Neuroscience Working Group for Chemical Defense	Member Member	Dr. A. W. Kirby CPT T. H. Harding

Committee	Affiliation	Individual
US AIR FORCE		
Test Plan Working Group: Second Generation Chemical Warfare Defense Personnel Protective Garment Program	Member	MAJ G. A. Nagel
FEDERAL AVIATION ADMINISTRATION		
Seat Committee	Member	Mr. J. L. Haley, Jr.
NATIONAL ACADEMY OF SCIENCES-- NATIONAL RESEARCH COUNCIL		
Committee on Vision	Army Representative Member Member Member	MAJ B. C. Leibrecht LTC R. W. Wiley Dr. J. K. Crosley Dr. I. Behar
Committee on Hearing, Bioacoustics, and Biomechanics (CHABA)	Army Representative Member Member	MAJ B. C. Leibrecht Dr. J. H. Patterson Mr. R. T. Camp, Jr.
NORTH ATLANTIC TREATY ORGANIZATION-- ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT		
Behavioral Sciences Committee, AMP	Member	Dr. K. A. Kimball
Evaluation of Methods to Assess Workload, AMP Working Group 08	Member	Dr. K. A. Kimball
Research Study Group 6, Effects of Impulse Noise	Member	Dr. J. H. Patterson
US ARMY AVIATION CENTER		
NBC Steering Committee	Member	Dr. F. S. Knox III
Army Aviation Threat Committee	Member	Dr. K. A. Kimball
Army Aviation Mission Area Analysis	Member	Dr. K. A. Kimball
Fort Rucker Flight Standardization Committee	Member	MAJ R. A. Huether

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Appendix

Research and Technology Work Unit Summaries (DD 1498) for FY82

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	REPORT CONTROL SYMBOL	
				DAOG 5999	82 10 01	DD DR&F:AKJ636	
3 DATE PREVIOUS ^a	4 KIND OF SUMMARY	5 SUMMARY SCY ^a	6 WORK SECURITY ^a	7 REGRADING ^a	8A DMSN INSTR ^a	8B SPECIFIC DATA CONTRACTOR ACCESS ^a	9 LEVEL OF BUS ^a
	CHANGE	U	U		NL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	A WORK UNIT
10 NO CODES ^a	PROGRAM ELEMENT	PROJECT NUMBER		TASK AREA NUMBER	WORK UNIT NUMBER		
A. PRIMARY	01102A	3M161102RS10		CB	283		
B. CONTRIBUTING							
C. CONTRIBUTING	STOG 80 7.2.4						
11 TITLE (Precede with Security Classification Code) ^a							
(U) Physiology and Psychophysics of Information Transfer in the Visual System							
12 SCIENTIFIC AND TECHNOLOGICAL AREAS ^a							
012900 Physiology; 012000 Optics; 002400 Bioengineering							
13 START DATE		14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD	
80 10		CONT		DA		C. IN-HOUSE	
17 CONTRACT GRANT				18 RESOURCES ESTIMATE		19 PROFESSIONAL MAN YRS	
A. DATES/EFFECTIVE		B. EXPIRATION		PRECEDING			
C. NUMBER ^a		D. AMOUNT		FISCAL YEAR		FUND (\$ in thousands)	
E. TYPE		F. CUM. AMT.		82		5.6	
G. KIND OF AWARD		H. CUM. AMT.		83		4.5	
19 RESPONSIBLE DOD ORGANIZATION				20 PERFORMING ORGANIZATION			
NAME ^a US Army Aeromedical Research Laboratory				NAME ^a US Army Aeromedical Research Laboratory			
ADDRESS ^a Fort Rucker, AL 36362				ADDRESS ^a Sensory Research Division			
				ADDRESS ^a Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Precede SSAN if U.S. Academic Institution)			
NAME: PRICE, D.R.				NAME ^a Harding, T.H.			
TELEPHONE: (205) 255-6917				TELEPHONE: (205) 255-6819			
21 GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
Foreign Intelligence Considered				ASSOCIATE INVESTIGATORS			
				NAME: HOLLY, F.F.			
				NAME: KIRBY, A.W. POC: DA			
22 KEYWORDS (Precede EACH with Security Classification Code) ^a (U)Retinal Physiology; (U)Visual Psychophysics; (U)Human (U)Visual Performance; (U)Visual Adaptation; (U)Visual Neuropharmacology; (U)Animals							
23. (U) The objective is to provide quantitative information on the physiological processes and mechanisms which underlie visual perception so as to provide a data base which supports applied vision research. By exploring retinal and cortical processes which are involved in the transfer of visual information, a quantitative link may be established between neural mechanisms and visual performance.							
24. (U) The approach primarily includes single and multiple recording techniques in animals and evoked potential and psychophysical procedures in human subjects. Results from animals will be used to construct models of the human visual system. A multidisciplinary approach will include (1) neurophysiology, neuropharmacology and neuroanatomy, (2) optical physics, optometry and physiological optics, and (3) sensory psychology.							
25. (U) 8110-8209. An electro-optical display system for the rapid assessment of visual contrast sensitivity was designed, developed and completed. An experimental method was developed for assessing, via non-invasive electrophysiology means, the relative chromatic perception (photopic luminosity curve) of an individual. An electronic system for producing well controlled spatial-temporal patterns on a CRT and a three-channel Maxwellian view optical system which used light emitting diodes as sources was completed. In an attempt to develop a suitable scotopic model, electrophysiological experiments were begun to analyze the photoreceptor properties in the bushbaby retina. A project designed to correlate results from visual evoked response analysis with results from flicker photometry was initiated as was a study designed to compare different methods of determining visual contrast sensitivity. Several computer programs for controlling stimulus presentations, data acquisition and analysis were developed. This work unit also supported the development of an electron microscopy facility to provide ultrastructural and histochemical analysis of mammalian retinac.							

^a Available to contractors upon originator's approval.

DD FORM 1498
1 MAR 68

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 65 AND 1498 1 1 MAR 68 (FOR ARMY USE) ARE OBSOLETE.

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION	2 DATE OF SUMMARY	REPORT CONTROL SYMBOL	
				DA OB 6889	82 10 01	DD FORM 1498A	
3 DATE PREP. SUMMARY	4 KIND OF SUMMARY	5 SUMMARY CLASS	6 WORK SECURITY	7 REGRADING	8A DISSEM INSTN	8B SPECIFIC DATA CONTRACTOR ACCESS	9 LEVEL OF SUM
81 10 01	D. CHANGE	U	U		NI	YES NO	A. WORK UNIT
10 NO. CODES	PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER	WORK UNIT NUMBER			
A. PRIMARY	61102A	3M161102BS10	CB	282			
B. CONTRIBUTING							
C. CONTRIBUTING	STOG 80 7.2.4						
11 TITLE (Precede with Security Classification Code)							
(U) Military Acoustic Hazards: Mechanisms of Hearing Loss							
12 SCIENTIFIC AND TECHNOLOGICAL AREAS 000200 Acoustics; 012400 Personnel Selection and Maintenance (medical); 007900 Industrial (occupational) Medicine							
13 START DATE	14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD		
78 10	CONT		DA		C. In-House		
17 CONTRACT GRANT				18 RESOURCES ESTIMATE		A. PROFESSIONAL MAN YRS	
A. DATES/EFFECTIVE				B. ESTIMATE		B. FUNDS (in thousands)	
B. NUMBER				FISCAL YEAR		107	
C. TYPE				CURRENCY		259	
D. KIND OF AWARD				E. CUM. AMT.			
19 RESPONSIBLE DOD ORGANIZATION				20 PERFORMING ORGANIZATION			
NAME: US Army Aeromedical Research Laboratory				NAME: US Army Aeromedical Research Lab			
ADDRESS: Ft Rucker, AL 36362				Sensory Research Division			
				ADDRESS: Ft Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)			
NAME: Price, Dudley R.				NAME: Patterson, James H.			
TELEPHONE: (205) 255-6917				TELEPHONE: (205) 255-4408			
21 GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
Foreign Intelligence Considered				ASSOCIATE INVESTIGATORS			
				NAME: Mozo, Ben T.			
				POC: DA			
22 KEYWORDS (Precede EACH with Security Classification Code)							
(U) Humans; (U) Acoustics; (U) Personnel Selection and Maintenance (medical); (U) Industrial (occupational) Medicine; (U) Aircrafts; (U) Combat Vehicles; (U) Animals							
23. TECHNICAL OBJECTIVE, 24. APPROACH, 25. PROGRESS (Furnish individual paragraphs identified by number. Precede text of each with Security Classification Code.)							
23. (U) To establish the necessary and sufficient biomedical data base to support valid damage risk criteria to insure adequate hearing protection of Army personnel exposed to continuous noise.							
24. (U) Behavioral, histological, and electrophysiological procedures are used with animal models, and audiometric and psychophysical procedures are used with human subjects. Physical characteristics of continuous noise environments will be correlated with patterns of hearing loss.							
25. (U) 8110-8209 Data analysis and report preparation have continued on a study of the role of pigmentation in susceptibility to noise induced hearing loss. A second study to develop the swine as a large animal model was undertaken. Data collection is complete and a report is in preparation. Procedures to date have not proved adequate to produce an acceptable audiogram.							

Available to contractors upon originator's approval

DD FORM 1498

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A - NOV 65 AND 1498 - 1 MAR 66 (FOR ARMY USE) ARE OBSOLETE

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	REPORT CONTROL SYMBOL	
				DAAGC0151	82 10 01	DDIR&F ARJ636	
3 DATE PREV. SUMM ^a	4 KIND OF SUMMARY	5 SUMMARY SCY ^a	6 WORK SECURITY ^a	7 REGRADING ^a	8A DISB. INST ^a	8B SPECIFIC DATA CONTRACTOR ACCESS	9 LEVEL OF SUM
81 10 01	D. CHANGE	U	U		NL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	A. WORK UNIT
10 NO. CODES ^a	PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER	WORK UNIT NUMBER			
A. PRIMARY	62777A	3E162777A879	BH	165			
B. CONTRIBUTING							
4. KAT/PT/1/1/1/ STOG 80 7.2:4							
11. TITLE (Precede with Security Classification Code) ^a (U) Aeromedical Research of Operationally Significant Problems in the Army Aviation Environment							
12. SCIENTIFIC AND TECHNOLOGICAL AREAS ^a 003500 Clinical Medicine; 012900 Physiology; 001300 Aircraft							
13 START DATE	14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY	16 PERFORMANCE METHOD			
78 10	CONT		DA	C. In-House			
17. CONTRACT/GRANT				18 RESOURCES ESTIMATE	A. PROFESSIONAL MAN YRS		B. FUNDS (in thousands)
A. DATES/EFFECTIVE:				PRECEDENCE			
B. NUMBER ^a				FISCAL YEAR	82		186
C. TYPE:				CURRENCY	83		135
D. KIND OF AWARD:				F. CUM. AMT.			
19. RESPONSIBLE DOD ORGANIZATION				20. PERFORMING ORGANIZATION			
NAME: US Army Aeromedical Research Laboratory				NAME: US Army Aeromedical Research Laboratory			
ADDRESS: Fort Rucker, AL 36362				Biomedical Applications Research Div			
				ADDRESS: Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Pursuant to 38 USC 562 (a) Academic Institution)			
NAME: PRICE, D.R.				NAME: KIMBALL, K.A.			
TELEPHONE: (205) 255-6917				TELEPHONE: (205) 255-6861			
21. GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
FIC				ASSOCIATE INVESTIGATORS			
				NAME: SCHRIMSHER, R.H.			
				NAME: SIMMONS, R.R. POC: DA			
22. KEYWORDS (Precede EACH with Security Classification Code) ^a (U) Stress; (U) Biomedical Evaluation; (U) Aircraft; (U) Psychology; (U) Recording Devices; (U) Human Volunteers; (U) Aviation Medicine							
23. TECHNICAL OBJECTIVE, 24. APPROACH, 25. PROGRAM (Pursuant to individual paragraphs identified by number. Precede text of each with Security Classification Code.)							
<p>23. (U) The objective of this project is to provide a definitive assessment of medical problems peculiar to the aviation environment and prepare guidelines for field commanders on the impact of these problems on the aviation mission. The results of such research will aid in development of improved standards and biomedical techniques for the field flight surgeon to use in monitoring and treating aviator stress and fatigue as well as the medical standards for selection of aviators and air traffic controllers for specific assignments.</p> <p>24. (U) A multidisciplinary approach, utilizing physiological measuring techniques, flight surgeon assessments, as well as aircraft comparisons, will provide the method to analyze aviator performance in the operational environment. Parameters to be measured will include heart rate, respiration, biochemical stress indices, and inflight performance measurements.</p> <p>25. (U) 8110-8209. Results of the request from Health Services Command (HSC) to send a research team to four air ambulance units to evaluate and define hazards incurred by the units due to their unique military mission and environment have been presented to HSC. Results of the request from CG, USAAVNC, Fort Rucker, AL, to investigate attitudes of instructor pilots (IPs) concerning their workload, personal habits, off-duty habits, and other selected items of interest have been briefed to the CG, USAAVNC.</p>							

^a Available to contractors upon originator's approval.

DD FORM 1498
1 MAR 68

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 65 AND 1498-1 1 MAR 68 (FOR ARMY USE) ARE OBSOLETE.

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY					1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	3 REPORT CONTROL SYMBOL DD-DR&E(AR)636	
					DAOG1490	82 10 01		
4 DATE PREV SUMMARY	5 KIND OF SUMMARY	6 SUMMARY SCY ^a	7 WORK SECURITY ^a	8 REGRADING ^a	9A DISSEM INSTR ^a	9B SPECIFIC DATA CONTRACTOR ACCESS <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		9C LEVEL OF SUB A. WORK UNIT
81 10 01	K. COMPL	U	U		NL			
10 NO CODES ^a	PROGRAM ELEMENT	PROJECT NUMBER		TASK AREA NUMBER		WORK UNIT NUMBER		
A. PRIMARY	61101A	3A161101A91C		00		278		
B. CONTRIBUTING								
C. <i>Other/Other/Other</i>								
11 TITLE (Precede with Security Classification Code) ^a (U)Assessment of Visual Performance Based Upon New Knowledge of Retinal Function								
12 SCIENTIFIC AND TECHNOLOGICAL AREAS ^a 012000 Optics; 012900 Physiology								
13 START DATE		14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD		
81 03		82 09		DA		C. IN-HOUSE		
17 CONTRACT GRANT				18 RESOURCES ESTIMATE		19A PROFESSIONAL MAN YRS		19B FUNDS (In thousands)
A. DATES/EFFECTIVE		EXPIRATION		PRECEDENCE				
B. NUMBER ^a				FISCAL YEAR		82		0.5
C. TYPE		D. AMOUNT		CURRENT		83		0.0
E. KIND OF AWARD		F. CUM. AMT.						0
19. RESPONSIBLE DOD ORGANIZATION				20 PERFORMING ORGANIZATION				
NAME *US Army Aeromedical Research Laboratory				NAME *US Army Aeromedical Research Laboratory				
ADDRESS * Fort Rucker, AL 36362				Sensory Research Division				
				ADDRESS * Fort Rucker, AL 36362				
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)				
NAME. Price, D.R.				NAME * Holly, F.F.				
TELEPHONE (205) 255-6917				TELEPHONE (205) 255-6810				
				SOCIAL SECURITY ACCOUNT NUMBER				
21 GENERAL USE				ASSOCIATE INVESTIGATORS				
FIC				NAME: Behar, I.				
				NAME: Harding, T.H. POC: DA				
22 KEYWORDS (Precede EACH with Security Classification Code) (U) Vision; (U) Visual Psychophysics; (U) Visual Performance; (U) Visual Sensitivity; (U) Visual Screening; (U) Volunteers								
23. TECHNICAL OBJECTIVE, 24. APPROACH, 25. PROGRESS (Furnish individual paragraphs identified by number. Precede text of each with Security Classification Code.)								
<p>23. (U) This basic research program will attempt to identify mechanisms subserving selected visual tasks and to develop advanced testing procedures which quantitatively examine the visual skills of military personnel. Two distinct parallel pathways have been discerned in the visual system and their properties suggest that one channel (sustained) may be predominantly involved in the resolution of fine spatial detail within a visual scene whereas the other channel (transient) may be more involved in the detection of coarse, moving targets. Current optometric tests of visual resolution may provide only limited information about one of these channels.</p> <p>24. (U) Our approach is twofold. One approach is to evaluate the sensitivity characteristics of the sustained channel by presenting spatial stimuli of two different colors both within and outside of the adapting area. The second approach is to evaluate a method for the rapid assessment of contrast sensitivity which may provide a new research and clinical tool.</p> <p>25. (U) 8110-8209. The electro-optical display system (spatial bandwidth equalization method) for the rapid assessment of visual contrast sensitivity was completed and calibrated. The correlation of contrast sensitivity obtained with the new system and traditional approaches are being evaluated. This evaluation and further utilization of the system is being conducted under a core program.</p>								

DD FORM 1498
1 MAR 66

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE DD FORMS 1498A 1 NOV 65
AND 1498 1 MAR 66 FOR ARMY USE ARE OBSOLETE

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION	2 DATE OF SUMMARY	REPORT CONTROL SYMBOL	
				DA OG 5998	82 10 01	DD DR&E:ARJ036	
3 DATE PREP. SUMMARY	4 KIND OF SUMMARY	5 SUMMARY SCTY	6 WORK SECURITY	7 REGRADING	8A DISSEM INSTR	8B SPECIFIC DATA CONTRACTOR ACCESS	9 LEVEL OF SUM
81 10 01	D. CHANGE	U	U		NI	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	A. WORK UNIT
10 NO. CODES*	PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER	WORK UNIT NUMBER			
A. PRIMARY	62777A	3E162777A878	AA	136			
B. CONTRIBUTING							
C. CONTRIBUTING	STOG 80 7.2:4						
11 TITLE: (Precede with Security Classification Code)							
(U) Auditory Effects of Blast Overpressure							
12 SCIENTIFIC AND TECHNOLOGICAL AREAS* 000200 Acoustics; 013300 Protective Equipment; 007900 Industrial (occupational) Medicine							
13 START DATE	14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD		
80 10	CONT		DA		C. In-House		
17 CONTRACT GRANT				18 RESOURCES ESTIMATE		19 PROFESSIONAL MAN YRS	
A. DATES/EFFECTIVE				PRECEDING			
B. NUMBER*				FISCAL YEAR		B. FUNDS (in thousands)	
C. TYPE				82		2.7	
D. AMOUNT				CURRENT		354	
E. KIND OF AWARD				83		2.7	
F. CUM. AMT.						387	
19 RESPONSIBLE OOD ORGANIZATION				20 PERFORMING ORGANIZATION			
NAME* US Army Aeromedical Research Laboratory				NAME* US Army Aeromedical Research Lab			
ADDRESS* Fort Rucker, AL 36362				ADDRESS* Sensory Research Division Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)			
NAME. Price, Dudley R.				NAME* Patterson, James H., Jr.			
TELEPHONE. (205) 255-6917				TELEPHONE (205) 255-4408			
21 GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
Foreign Intelligence Considered				ASSOCIATE INVESTIGATORS			
				NAME Mozo, Ben T.			
				NAME POC: DA			
22 KEYWORDS (Precede EACH with Security Classification Code) (U) Acoustics; (U) Protective Equipment; (U) Industrial (occupational) Medicine; (U) Weapons Effects; (U) Impulse Noise; (U) Animals (U) Humans							
23. TECHNICAL OBJECTIVE* 24. APPROACH, 25. PROGRESS (Furnish individual paragraphs identified by number. Precede text of each with Security Classification Code)							
<p>23. (U) To define the physiologic effects upon the auditory system of blast overpressure generated by firing Army weapon systems. The physical characteristics of the pressure wave responsible for injury to the auditory system will be determined. Potential protective technology, approaches, and devices will be evaluated.</p> <p>24. (U) The approach is three pronged: 1. Physical measurements to define the nature of the noise and on which to base hazard assessment. 2. Direct validation of hearing protective devices and development of indirect methods to determine their adequacy. 3. Basic animal and human studies to develop a data base for more accurate tolerance limits (damage risk criteria) for impulse noise.</p> <p>25. (U) 8110-8209. A direct validation of hearing protection for the M198/M203 was completed. Results indicate that foam earplugs (EAR) provide adequate protection for up to 12 rounds per day. A report is in preparation. Animal studies of the injury from exposure to mixed levels of impulse noise were completed. Results indicate that averaging of impulse noise levels do not provide an adequate indication of the hazard to hearing. Extension of these studies is pending.</p>							

DD FORM 1498

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 88 AND 1498B 1 MAR 89 FOR ARMY USE ARE OBSOLETE

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	REPORT CONTROL SYMBOL ^a	
				DAOB 6886	82 10 01	DD FORM 1498 11-83	
3 DATE PREV SUMMARY	4 KIND OF SUMMARY	5 SUMMARY SCY ^a	6 WORK SECURITY ^a	7 REGRADING ^a	8A ORIGIN INSTN ^a	8B SPECIFIC DATA CONTRACTOR ACCESS ^a	9 LEVEL OF SUB A. WORK UNIT
81 10 01	D. CHANGE	U	U		NL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
10 NO CODES ^a	PROGRAM ELEMENT	PROJECT NUMBER		TASK AREA NUMBER	WORK UNIT NUMBER		
A. PRIMARY	62777A	3E162777A878		AC	135		
B. CONTRIBUTING							
f./c/b/y/h/p/s/t/r/a/ STOG 80 7.2:4							
11 TITLE (Precede with Security Classification Code) ^a							
(U) Medical Assessment of Hearing Protective Devices							
12 SCIENTIFIC AND TECHNOLOGICAL AREAS ^a 000200 Acoustics; 013300 Protective Equipment; 007900 Industrial (occupational) Medicine							
13 START DATE		14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD	
76 10		CONT		DA		C. In-House	
17 CONTRACT GRANT				18 RESOURCES ESTIMATE		19 PROFESSIONAL MAN YRS	
A. DATES/EFFECTIVE				PRECEDING		B. FUNDS (in thousands)	
B. NUMBER ^a				FISCAL YEAR		202	
C. TYPE:				CURRENCY		409	
D. KIND OF AWARD:				83		3.5	
E. CUM. AMT.						409	
20 RESPONSIBLE DOD ORGANIZATION				21 PERFORMING ORGANIZATION			
NAME: US Army Aeromedical Research Laboratory				NAME: US Army Aeromedical Research Laboratory			
ADDRESS: Fort Rucker, AL 36362				ADDRESS: Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)			
NAME: Price, D.R.				NAME: Mozo, Ben T.			
TELEPHONE: (205) 255-6917				TELEPHONE: (205) 255-4408			
22 GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
Foreign Intelligence Considered				ASSOCIATE INVESTIGATORS			
				NAME: Camp, Robert T., Jr.			
				POC: DA			
23 KEYWORDS (Precede EACH with Security Classification Code) ^a (U)Acoustics; (U)Protective Equipment; (U)Humans; (U)Industrial (Occupational) Medicine; (U)Aircraft; (U)Radio Communication; (U)Weapons Effect							
24 TECHNICAL OBJECTIVE, 25 APPROACH, 26 PROGRESS (Furnish individual paragraphs identified by number. Precede text of each with Security Classification Code)							
23. (U) This research assesses the sound-attenuating characteristics of passive and active hearing protective devices, establishes their suitability to meet the needs of the Army, develops new hearing protective devices, determines laboratory and field techniques for evaluation, and investigates any associated medical effects on audiologic performance.							
24. (U) Methods utilized for the determination of the sound attenuation characteristics of hearing protective devices will be ANSI Z22.24-1957 and ASA STD 1-1975. Objective laboratory and field electroacoustic methods will also be used.							
25. (U) 8110-8209. Evaluated the IHADSS helmet for the AH-64 Advanced Attack Helicopter (USAARL LR 82-6-2-1, Prototype Testing of the Integrated Helmet Unit for the Integrated Helmet and Display Sighting System) and the Norton Silent Bandit (report pending) hearing protective devices to determine applicability for Army use. Measured the devices included in TB Med 501 using the current standard S3.19 (data analyses are in progress). Compared SPH-4 and DH-132 attenuation when measured with S3.19 and Z24.22 to determine specification values required for real-ear attenuation when using the S3.19 standard for procurement (analysis in progress). Investigated the effects of CD mask and oxygen mask on the speech intelligibility and real-ear attenuation of the SPH-4 Aviator helmet (report in progress). Completed evaluation of SPH-4s produced by two manufacturers (USAARL Report No. 82-4, Comparative Evaluation of SPH-4 Helmets from DLA 100-80-C-2226 and DLA 100-78C-1041).							

^a Available to contractors upon originator's approval.

DD FORM 1498
1 MAR 68

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 85
AND 1498-1 1 MAR 68 (FOR ARMY USE) ARE OBSOLETE.

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION		2 DATE OF SUMMARY		REPORT CONTROL SYMBOL	
				DA OG0167		82 10 01		DD-DR&E(AR)636	
3 DATE PREV. SUMMRY		4 KIND OF SUMMARY		5 SUMMARY SCTY		6 WORK SECURITY		7 REGRADING	
S1 10 01		D. CHANGE		U		U		NL	
8A DISB'N INSTR'N		8B SPECIFIC DATA: CONTRACTOR ACCESS		8C LEVEL OF SUM		8D WORK UNIT			
10 NO. CODES		PROGRAM ELEMENT		PROJECT NUMBER		TASK AREA NUMBER		WORK UNIT NUMBER	
A. PRIMARY		62777A		3E162777A878		AG		131	
B. CONTRIBUTING									
C. COPY/REPLY/INTG/		STOG 80 7.2:4							
11 TITLE (Precede with Security Classification Code)									
(U) Biodynamics of Life Support Equipment and Personnel Armor									
12 SCIENTIFIC AND TECHNOLOGICAL AREAS									
008800 Life Support; 016200 Stress Physiology; 002400 Bioengineering									
13 START DATE		14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD			
78 10		CONT		DA		C. In-House			
17 CONTRACT GRANT				18 RESOURCES ESTIMATE		19 PROFESSIONAL MAN YRS		20 FUNDS (In thousands)	
A. DATES/EFFECTIVE				B. PRECEDING		C. CURRENT		D. FUTURE	
B. NUMBER				82		2.8		63	
C. TYPE				83		3.9		297	
D. KIND OF AWARD:				F. CUM. AMT.					
18 RESPONSIBLE DOD ORGANIZATION				19 PERFORMING ORGANIZATION					
NAME: US Army Aeromedical Research Laboratory				NAME: US Army Aeromedical Research Lab					
ADDRESS: Fort Rucker, AL 36362				ADDRESS: Fort Rucker, AL 36362					
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)					
NAME: Price D R				NAME: Shanahan, D F					
TELEPHONE: 205-255-6917				TELEPHONE: 205-255-6943					
21 GENERAL USE				22 ASSOCIATE INVESTIGATORS					
				NAME: Hundley, T A					
				POC: DA					
23 KEYWORDS (Precede EACH with Security Classification Code)									
(U) Protective Equipment; (U) Stress Physiology;									
(U) Musculoskeletal Systems; (U) Biomedical; (U) Man-Machine Relationships									
24 TECHNICAL OBJECTIVE, 25 APPROACH, 26 PROGRAM (Furnish individual paragraphs identified by number. Precede text of each with Security Classification Code.)									
23. (U) To provide a technological data base relating to the biomedical aspects of the evaluation of life support equipment (LSE) and its correlation with injury data collected from the field, to identify hazard protection problems associated with LSE and to provide conceptual design recommendations and criteria to improve LSE and personnel armor, to provide evaluation of crash-related LSE through tri-service LSE Retrieval Program (LSERP).									
24. (U) Army aviation life support equipment involved in either injury causation or prevention in the field are sent to USAARL for biomedical and injury correlation evaluation. This evaluation assesses the effectiveness/deficiencies of the life support equipment through an analysis of the physical condition of the protective devices, the human injury incurred, and the related human dynamics involved in the accident. The analysis is accomplished by the application of epidemiologic methods, medically related engineering failure mode analysis, accident investigative procedures, forensic pathology, mathematical modeling and applied bioengineering research techniques.									
25. (U) 8110-8209. A presentation was made to AGARD ("Analysis of US Army Aviation Mishap Injury Patterns," Apr 82) and published as USAARL Technical Report (TR 82-2). Through on site investigation of all UH-60 Class A accidents a deficiency in restraint system was identified and corrected. As a routine function of the LSERP, over 100 aircraft mishap reports were reviewed and eight cases studied in depth. Equipment returned from these accidents included 43 helmets (4 USAF), 18 seats and restraint systems, and two night vision goggles. Evaluation reports were submitted to the appropriate service personnel for this equipment. Co-hosted UH-60A Crashworthiness Conference with U.S. Army Safety Center.									

DD FORM 1498

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 68 AND 1498-1 1 MAR 69 (FOR ARMY USE) ARE OBSOLETE.

DD FORM 1498

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE DD FORMS 1498A 1 NOV 65
AND 1498-1 1 MAR 66 FOR ARMY USE ARE OBSOLETE

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION	2 DATE OF SUMMARY	REPORT CONTROL SYMBOL	
				DA006100	82 10 01	DD FORM 1498	
3 DATE PREVIOUS SUMMARY	4 KIND OF SUMMARY	5 SUMMARY SECURITY	6 WORK SECURITY	7 REGRADING	8A DISSEMINATION	8B SPECIFIC DATA CONTRACTOR ACCESS	9 LEVEL OF SUMMARY
81 10 01	D. CHANGE	U	U		NL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	A. WORK UNIT
10 NO. CODES	PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER	WORK UNIT NUMBER			
	62777A	3E162777A878	AD	132			
A. PRIMARY							
B. CONTRIBUTING							
C. CONTRIBUTING		STOG 80.7.2.4					
11 TITLE (Precede with Security Classification Code)							
(U) Vibration Hazards of Combat Aircraft and Vehicles							
12 SCIENTIFIC AND TECHNOLOGICAL AREAS 007500 Human Factors Engineering; 00940 Man-Machine Relations; 001290 Physiology; 008800 Life Support							
13 START DATE		14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD	
		CONT		DA		C. In-House	
17 CONTRACT GRANT				18 RESOURCES ESTIMATE		A. PROFESSIONAL MAN YRS	
A. DATES/EFFECTIVE				B. FUNDING		B. FUNDS (in thousands)	
B. NUMBER				FISCAL YEAR		82	
C. TYPE				CURRENT		83	
D. KIND OF AWARD				F. CUM. AMT.		85	
19 RESPONSIBLE DOD ORGANIZATION				20 PERFORMING ORGANIZATION			
NAME: US Army Aeromedical Research Laboratory				NAME: US Army Aeromedical Research Lab			
ADDRESS: Fort Rucker, AL 36362				ADDRESS: Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)			
NAME: Price, D R				NAME: Smith, J H			
TELEPHONE: 205-255-6917				TELEPHONE: 205-255-6883			
21 GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
Foreign Intelligence Considered				ASSOCIATE INVESTIGATORS			
				NAME			
				NAME			
				POC: DA			
22 KEYWORDS (Precede EACH with Security Classification Code)							
(U) Vibration; (U) Stress; (U) Activity; (U) Biodynamics; (U) Simulation; (U) Electromyography; (U) Fatigue; (U) Voluntary; (U) Performance							
23. TECHNICAL OBJECTIVE, 24 APPROACH, 25 PROGRAM (Furnish full and brief paragraphs identified by number. Precede text of each with Security Classification Code)							
<p>23. (U) To conduct multidisciplinary basic and applied biomedical engineering research to provide a scientific data base of medically pertinent information and design criteria to reduce or alleviate vibration insult to the operator of developmental equipment and systems. To determine short-term and cumulative biomedical effects of vibration on the musculoskeletal system and develop technological methods by which to reduce these effects. To duplicate the field environment of vibration to study effects on human health and performance. To evaluate and develop medical criteria on human vibration tolerance and to provide collateral support to human tolerance studies and materiel development.</p> <p>24. (U) Determine dynamic characteristics of the advanced combat vehicle technology program seat by Fourier transform techniques using instrumented human subjects on the USAARL multi-axis vibration table. Assess stress and fatigue reactions, including back muscle stress and fatigue, associated with operation of vehicle controls, video displays, target acquisition systems, and seat coupled vibration by psychophysiologic and electromyographic techniques.</p> <p>25. (U) 8110-8209. A subjective low back pain assessment of US Army aviators was completed. Data trends indicated that helicopter seating posture affected low back pain. The effects of whole-body random vibration on visual performance as a function of observer ocular characteristics were studied. A protocol for measuring in-flight neck muscle stress as a function of helmet weight and center of gravity was developed.</p>							

Available to contractors upon originator's approval

DD FORM 1498

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 65 AND 1498-1 1 MAR 66 FOR ARMY USE ARE OBSOLETE

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	REPORT CONTROL SYMBOL	
				DA060169	82 10 01	DD DR&E(AR)636	
3 DATE PREL. SUMMARY	4 KIND OF SUMMARY	5 SUMMARY SCTY ^a	6 WORK SECURITY ^a	7 REGRADING ^a	8A ORIGIN INSTN ^a	8B SPECIFIC DATA CONTRACTOR ACCESS ^a	9 LEVEL OF SUM A. WORK UNIT
81 10 01	P. CHANGE	U	U		DL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
10 NO. CODES ^a		PROGRAM ELEMENT		PROJECT NUMBER		TASK AREA NUMBER	
		62777A		3E162777A878		AF	
11 NO. CODES ^a		PROGRAM ELEMENT		PROJECT NUMBER		TASK AREA NUMBER	
		62777A		3E162777A878		AF	
12 NO. CODES ^a		PROGRAM ELEMENT		PROJECT NUMBER		TASK AREA NUMBER	
		62777A		3E162777A878		AF	
13 TITLE (Precede with security Classification Code) ^a (U) Biomedical Application and Health Hazard Assessment of Oxygen Enrichment Breathing Systems							
14 SCIENTIFIC AND TECHNOLOGICAL AREAS ^a							
15020 Stress Physiology; 005800 Life Support; 001300 Aircraft							
16 START DATE		17 ESTIMATED COMPLETION DATE		18 FUNDING AGENCY		19 PERFORMANCE METHOD	
70 03		CONT		DA		C. In-house	
20 CONTRACT GRANT				21 RESOURCES ESTIMATE			
A. DATES/EFFECTIVE				B. PROFESSIONAL MAN YRS			
EXPIRATION				C. FUNDS (in thousands)			
B. NUMBER ^a				PRECEDING			
C. TYPE				FISCAL YEAR			
D. KIND OF AWARD				CUM. AMT.			
19 RESPONSIBLE DOD ORGANIZATION				20 PERFORMING ORGANIZATION			
NAME ^a US Army Aeromedical Research Laboratory				NAME ^a US Army Aeromedical Research Laboratory			
ADDRESS ^a Fort Rucker, AL 36362				ADDRESS ^a Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)			
NAME Price, D. R.				NAME ^a Knox, F.S.			
TELEPHONE (205) 255-6917				TELEPHONE (205) 255-6860			
21 GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
FIC				ASSOCIATE INVESTIGATORS			
				NAME: Chaffin, W.A.			
				NAME: Weber, R.M.			
				POC: DA			
22 KEYWORDS (Precede EACH with Security Classification Code) (U) Oxygen Supply Equipment; (U) Life Support; (U) Stress Physiology; (U) Aircraft; (U) Toxicology; (U) Human Volunteers							
23. (U) To identify, assess, and prevent unnecessary health hazards associated with the flight environment and to obtain a biomedical data base on the human function associated with the use of aircraft oxygen enrichment breathing systems in the flight environment. To provide the Army data, information, recommendations and criteria to aid in the development and deployment of life support systems to alleviate identified health hazards.							
24. (U) The approach will consist of a biomedical evaluation of state-of-the-art oxygen enrichment breathing systems during aircraft ground and flight conditions. The evaluation will include the sampling of the environmental air input to the system as well as the system output enriched air. The samples will be analyzed to determine the systems' ability to effectively filter contaminants known to exist in the operational environment. Physiological data, heart rate, oxygen tension and respiratory functions as well as systems parameters, oxygen concentration, flow rates, temperatures and pressures will be collected during ground operations and aircraft flight at altitude to assess the ability of the system to provide aviators the required oxygen concentration and purity during various flight profiles. The data collected will be evaluated with respect to biomedical, safety, and man/machine limitations.							
25. (U) 8110-8209. Steady-state flight tests in the UH-1H rotary wing aircraft were completed and draft reports of results in both UH-1H and U21 were prepared. A revised report will combine the results into one report for publication. Results were reported at a symposium on Advanced Aircraft Oxygen Systems held in Nov 81 at the Royal Air Force Institute for Aviation Medicine in England. A lab was set up to study the effects of battlefield contaminants on OBOGS. The British P/O mask was studied in conjunction with the US MBU 12P mask. A draft report was written with publication in FY 83.							

DD FORM 1498

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 85 AND 1498 1 MAR 85 FOR ARMY USE ARE OBSOLETE

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	REPORT CONTROL SYMBOL	
				DAOG0165	82 10 01	DD DR&E(AR)636	
3 DATE PREV SUMMARY	4 KIND OF SUMMARY	5 SUMMARY SCTY ^b	6 WORK SECURITY ^b	7 REGRADING ^c	8 DISSEM INSTR ^c	9a SPECIFIC DATA CONTRACTOR ACCESS ^d	9b LEVEL OF SUM A. WORK UNIT
81 10 01	D. CHANGE	U	U		NL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
10 NO / CODES ^e	PROGRAM ELEMENT	PROJECT NUMBER		TASK AREA NUMBER		WORK UNIT NUMBER	
a. PRIMARY	62777A	3E162777A878		AF		133	
b. CONTRIBUTING							
L/che/108114/ STOC 80 7.2:4							
11 TITLE (Precede with Security Classification Code)							
(U) Research Countermeasures for Significant Medical Hazards in Military Systems							
12 SCIENTIFIC AND TECHNOLOGICAL AREAS ^f 006000 Escape, Rescue and Survivability 002400 Bioengineering 016200 Stress Physiology							
13 START DATE		14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD	
78 10		CONT		DA		C. In-House	
17 CONTRACT/GRANT				18. RESOURCES ESTIMATE		19. PROFESSIONAL MAN YRS	
a. DATES/EFFECTIVE				PRECEDING			
b. NUMBER ^g				FISCAL YEAR		h. FUNDS (In thousands)	
c. TYPE:				82		5.1	
d. KIND OF AWARD.				83		495	
e. CUM. AMT.				5.4		495	
20. RESPONSIBLE DOD ORGANIZATION				21. PERFORMING ORGANIZATION			
NAME: US Army Aeromedical Research Laboratory				NAME: US Army Aeromedical Research Laboratory			
ADDRESS: Fort Rucker, AL 36362				Biomedical Applications Research Div			
				ADDRESS: Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)			
NAME: Price, D. R.				NAME: Knox, F.S.			
TELEPHONE: (205) 255-6917				TELEPHONE: (205) 255-6860			
22. GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
FIC				ASSOCIATE INVESTIGATORS			
				NAME: Chaffin, W.A. POC: DA			
				NAME: Nagel, G.A.			
23. KEYWORDS (Precede EACH with Security Classification Code) (U) Hazards; (U) Protective Equipment; (U) Stress Physiology; (U) Life Support; (U) Bioengineering; (U) Biochemistry; (U) Human Volunteers							
24. TECHNICAL OBJECTIVE, 25. APPROACH, 26. PROGRESS (Furnish individual paragraphs identified by number. Precede text of each with Security Classification Code.)							
<p>23. (U) Conduct applied medical research to identify, assess and prevent unnecessary health hazards and personnel injuries imposed by exposure to the operational environment, toxic gases, oxygen levels, chemical and biological agents, and to provide the Army technical information, recommendations and standards to be used in the development and modification of systems that provide protection from those hazards.</p> <p>24. (U) The approach involves the application of physiological and biomedical applied research methods utilizing physical examinations, x-rays, and biochemical analysis techniques to isolate the hazards involved and determine required protective measures. These techniques will be applied to the establishment of biomedical requirements of environmental control systems and oxygen generating systems, life support survival equipment and aeromedical evacuation and rescue equipment.</p> <p>25. (U) 8110-8209. Data from studies of chemical defense ensembles worn inflight during hot weather were analyzed. The results were reported at the Army Aeromedical Concept Review Committee meeting, 22-26 Feb 82, the USAMRDC Bioscience Review Committee Meeting, 13-14 May 82, and to various individuals including: The Honorable Amoretta Hoeber, Asst Secretary of Defense; Dr. Scully, Asst Secretary of the Army; MG Garrison Rapmund, CG, USAMRDC; LTG Otis, TRADOC Cdr; Dr. Charles Hubley and Dr. Kenneth Ackles, Defence Research and Development, Canadian Liaison Staff; and Group CPT Fisher, United Kingdom Embassy, Washington, DC. A proposed research plan was outlined to USAMRDC staff in the spring of 1982 to cover the succeeding 3 to 5 years.</p>							

^a Available to contractors upon originator's approval

DD FORM 1498
1 MAR 82

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE DD FORMS 1498A 1 NOV 85
AND 1498-1 1 MAR 88 (FOR ARMY USE) ARE OBSOLETE

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1. AGENCY ACCESSION ^a	2. DATE OF SUMMARY ^a	REPORT CONTROL SYMBOL ^a	
				DAOH 0152	82 10 01	DD-DR&E(AR)36	
3. DATE PREV SUMMARY	4. KIND OF SUMMARY	5. SUMMARY SCTY ^a	6. WORK SECURITY ^a	7. REGRADING ^a	8. DISSEM INSTR ^a	9. SPECIFIC DATA - CONTRACTOR ACCESS ^a	10. LEVEL OF SUB A. WORK UNIT
82 03 15	D. CHANGE	U	U		NL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
10. NO. / CODES ^a		PROGRAM ELEMENT		PROJECT NUMBER		TASK AREA NUMBER	
A. PRIMARY		61101A		3A161101A91C		00	
B. CONTRIBUTING						291	
C. CONTRIBUTING							
11. TITLE (Precede with Security Classification Code) ^a							
(U) Development of Military/ASTM Standard Method for Rapid Assessment of Burn Hazard							
12. SCIENTIFIC AND TECHNOLOGICAL AREAS ^a 002400 Bioengineering; 012900 Physiology; 009700 Mathematics and Statistics; 013300 Protective Equipment							
13. START DATE		14. ESTIMATED COMPLETION DATE		15. FUNDING AGENCY		16. PERFORMANCE METHOD	
82 06		84 09		DA		C. In-House	
17. CONTRACT/GRANT				18. RESOURCES ESTIMATE		19. PROFESSIONAL MAN YRS	
A. DATES/EFFECTIVE:				PRECEDENCE		B. FUNDS (in thousands)	
B. NUMBER: ^a				FISCAL YEAR		C. FUNDS	
C. TYPE:				82		0.3	
D. KIND OF AWARD:				CURRENCY		6	
E. CUM. AMT.				83		0.1	
20. RESPONSIBLE DOD ORGANIZATION				21. PERFORMING ORGANIZATION			
NAME: ^a US Army Aeromedical Research Laboratory				NAME: ^a US Army Aeromedical Research Laboratory			
ADDRESS: ^a Fort Rucker, AL 36362				ADDRESS: ^a Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)			
NAME: Price, D.R.				NAME: ^a Knox, F.S. III			
TELEPHONE: (205) 255-6917				TELEPHONE: (205) 255-6860			
22. GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
FIG				ASSOCIATE INVESTIGATORS			
				NAME:			
				NAME: POC: DA			
23. REVISIONS (Precede EACH with Security Classification Code) ^a (U) Burns; (U) Mathematical Models; (U) Digital Simulation; (U) Heat Transfer; (U) Protective Clothing							
24. TECHNICAL OBJECTIVE, ^a 24. APPROACH, 25. PROGRAM (Furnish individual paragraphs identified by number. Precede text of each with Security Classification Code.)							
23. (U) Development of clinically valid, military/ASTM standard method for rapidly assessing the burn hazard associated with the use of flammable and so-called nonflammable fabrics in a variety of applications, e.g., aircrew, tankcrew and firefighter clothing, and with exposure to other thermal sources, e.g., weapons exhaust and lasers.							
24. (U) The approach will involve modification of USAARL's existing model, BRNSIM, to optimize its performance in predicting burn depth when compared with burn data from four sources (USAARL porcine burn data base, University of Rochester porcine data, Stroll's human burn data and Moritz and Henriques' porcine data) while taking into account the dynamics of convective cooling of skin by blood, the characteristics of various heat flux sources, and the need for speed as well as accuracy. Method will employ calibrated heat flux sensors, a fire simulator and microprocessor based system which will sample the output of the sensor monitoring the fire simulator, the output of the sensor monitoring the energy transferred through or emanating from a fabric and calculate the depth of the burn which would have occurred if porcine (and by inference, human) skin had been exposed to the thermal source for the period in question.							
25. (U) 8203-8209. During FY 82, BRNSIM was installed on a PDP 11/03 microcomputer. BRNSIM was reprogrammed to use different activation energies and rate constants for expidermal and dermal nodes. This feature permits the model to predict accurately from very shallow burns (approximately equal to 80+ microns) to very deep burns (1500-2000 microns). Model will continue to be optimized in FY 83, checking predictions against existing data bases.							

^a Available to contractors upon originator's approval

DD FORM 1498
1 MAR 82

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 83 AND 1498-1 1 MAR 82 (FOR ARMY USE) ARE OBSOLETE

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1. AGENCY ACCESSION ^a	2. DATE OF SUMMARY ^a	REPORT CONTROL SYMBOL	
				DAOG1505	82 10 01	DD-DR&E(AR)636	
3. DATE PREV. SUMMARY	4. KIND OF SUMMARY	5. SUMMARY SCTY ^a	6. WORK SECURITY ^a	7. REGRADING ^a	8a. ORIGIN INSTR ^a	8b. SPECIFIC DATA: CONTRACTOR ACCESS	9. LEVEL OF SUM
81 10 01	D. CHANGE	U	U		NL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	A. WORK UNIT
10. NO. CODES ^a		PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER		WORK UNIT NUMBER	
a. PRIMARY		61102A	3A161101A91C	00		279	
b. CONTRIBUTING							
c. CONTRIBUTING							
11. TITLE (Precede with Security Class., if Applicable) ^a							
(U) Cardiopulmonary Physiology in Army Aviators							
12. SCIENTIFIC AND TECHNOLOGICAL AREAS ^a							
012900 Physiology; 016200 Stress Physiology; 012400 Personnel Selection and Maintenance							
13. START DATE		14. ESTIMATED COMPLETION DATE		15. FUNDING AGENCY		16. PERFORMANCE METHOD	
81 03		83 02		DA		C. In-house	
17. CONTRACT GRANT				18. RESOURCES ESTIMATE			
a. DATES/EFFECTIVE		EXPIRATION:		PRECEDING		a. PROFESSIONAL MAN YRS	
b. NUMBER ^a				FISCAL YEAR		b. FUNDS (in thousands)	
c. TYPE		d. AMOUNT:		82		0.5	
e. KIND OF AWARD:		f. CUM. AMT.		83		0.0	
19. RESPONSIBLE DDO ORGANIZATION				20. PERFORMING ORGANIZATION			
NAME ^a : US Army Aeromedical Research Laboratory				NAME ^a : US Army Aeromedical Research Laboratory			
ADDRESS ^a : Fort Rucker, AL 36362				Biomedical Applications Research Div			
				ADDRESS ^a : Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic institution)			
NAME: Price, D. R.				NAME ^a : Knox, F. S.			
TELEPHONE: (205) 255-6917				TELEPHONE: (205) 255-6860			
				SOCIAL SECURITY ACCOUNT NUMBER:			
21. GENERAL USE				ASSOCIATE INVESTIGATORS			
FIC				NAME: Campbell, D.L. POC: DA			
				NAME:			
22. KEYWORDS (Precede EACH with Security Classification Code)							
(U) Aviators; (U) Pulmonary Physiology; (U) Stress Physiology; (U) Human Volunteers							
23. TECHNICAL OBJECTIVE, 24. APPROACH, 25. PROGRESS (Furnish individual paragraphs identified by number. Precede rest of each with Security Classification Code.)							
23. (U) To develop and define relevant physiological parameters, for active duty Army aviators, which can be applied to medical selection and retention criteria; develop and validate discrete levels of combat fitness, for active duty Army aviators, based on selected cardiopulmonary parameters.							
24. (U) To establish statistically validated levels of physiological fitness, among the subject, active duty Army aviator population, based on the innovative application of the following technologies: water-sealed spirometry, infrared spectrophotometry, body plethysmography, ear oximetry, lung-Nitrogen wash-outs, helium iso-flows and dilutions, closing volumes, pulmonary capillary diffusions, airway resistances, non-invasive cardiac output and respiratory quotient determinations.							
25. (U) 8110-8209. During FY 82, conducted tests on 103 active duty Army aviators. A preliminary analysis was conducted on the forced expiratory volume in one second divided by the forced vital capacity (fev1/FVC%) and on the forced expiratory flow over the range 25% to 75% of predicted (fef 25-75%). These data were derived from the flow volume loops recorded during the spirometry section of the test. If either of these values was less than 80% of predicted, it was considered abnormal (West 1977). Minimal obstructive disease was recorded if the values were between 70 and 80%; moderate was chosen if the values fell between 60 and 70%; and severe was recorded for all values below 60%. Using these criteria, 34 of the 103 aviators were judged to have some degree of obstructive disease. Abnormalities were seen in virtually all age groups, both smokers and non-smokers.							

^a Available to Contractors upon contractor's approval.

DD FORM 1498

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 85 AND 1498-1 1 MAR 88 (FOR ARMY USE) ARE OBSOLETE.

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	REPORT CONTROL SYMBOL	
				DA QB 6893	82 10 01	DD DR&F AR/636	
3 DATE PREV SUMRY ^a	4 KIND OF SUMMARY	5 SUMMARY SCTY ^a	6 WORK SECURITY ^a	7 REGRADING ^a	8a OBS'N INST'N ^a	8b SPECIFIC DATA CONTRACTOR ACCESS ^a	9 LEVEL OF BUR ^a
81 10 01	D. CHANGE	U	U		NL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	A. WORK UNIT
10 NO. CODES ^a	PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER	WORK UNIT NUMBER			
A. PRIMARY	62777A	3E162777A879	BG	164			
B. CONTRIBUTING							
4. FUNDING	STOG80-7.2:4						
11 TITLE (Precede with Security Classification Code) ^a							
(U) Military Visual Problems: Assessment, Mechanisms, and Protection							
12 SCIENTIFIC AND TECHNOLOGICAL AREAS ^a							
0012000 Optics; 012400 Personnel Selection and Maintenance; 009400 Man-Machine Relations							
13 START DATE		14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD	
76 10		CONT		DA		C. In-House	
17 CONTRACT GRANT				18 RESOURCES ESTIMATE		19 PROFESSIONAL MAN YRS	
A. DATES/EFFECTIVE:				PRECEDING		B. FUNDS (In thousands)	
B. NUMBER ^a				FISCAL YEAR		C. CURRENT	
C. TYPE				82		5.2	
D. KIND OF AWARD:				83		5.7	
E. CUM. AMT.						441	
F. CUM. AMT.						561	
20 RESPONSIBLE DOD ORGANIZATION				21 PERFORMING ORGANIZATION			
NAME: US Army Aeromedical Research Lab				NAME: US Army Aeromedical Research Lab			
ADDRESS: Fort Rucker, AL 36362				ADDRESS: Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)			
NAME: PRICE, Dudley R.				NAME: BEHAR, Isaac			
TELEPHONE: (205) 255-6917				TELEPHONE: (205) 255-6813			
22 GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
Foreign Intelligence Considered				ASSOCIATE INVESTIGATORS			
				NAME: HOLLY, F. F.			
				NAME: HARDING, T. H.			
				POC: DA			
23 KEYWORDS (Precede EACH with Security Classification Code)							
(U)Aircrew Selection; (U)Optical/Ophthalmic Material; (U)Animal; (U)Photometry/Radiometry; (U)Man-Machine Compatibility; (U)Visual Performance; (U)Human							
24 TECHNICAL OBJECTIVE ^a 25 APPROACH 26 PROGRAM (Furnish individual paragraphs identified by number. Precede text of each with Security Classification Code.)							
23. (U) The technical objectives are to develop methods for assessing potential visual problems created by military operational environments, to establish the underlying mechanisms of these visual problems, and to evaluate methods for protecting and enhancing visual performance. The data provided will impact: (a) crew selection and retention standards; (b) optimal visual performance criteria; (c) observer-display compatibility; and (d) assessment of medical and non-medical material.							
24. (U) The approach will include physical optics techniques of photometry, radiometry, and colorimetry; optics lab testing of distortion, prismatic deviation, power, transmittance, haze, neutrality, and resolution; psychophysical studies using human and animal observers; and neurophysiological studies using gross potential and single-cell recording.							
25. (U) 8110-8209. A modified faceplate for the AN/PVS-5 was conceived, developed, and evaluated. It allows unaided vision for the lateral and lower fields, color discrimination of aircraft and ground lights, map reading, spectacle wear, and improved comfort. Other accomplishments: USAARL Report 82-4, Comparative evaluation of SPH-4 helmets from DLA 100-80-C-2226 and DLA 100-78-C-1041; USAARL Report 82-1, Direct and neighboring sensitivity changes produced by red and blue-white adapting fields; USAARL Report 82-5, Oscillations in the visual response to pulsed stimuli; USAARL Report 82-10, Cathode-ray-tube raster line selector with horizontal modulation capability; USAARL LR-82-6-2-1, Prototype testing of the integrated helmet unit for the integrated helmet and display sighting system; Analysis of image smear in CRT displays, J. Ala. Aca. Sci.; Proceedings Aerospace Med. Assoc., May 1982, Bal Harbour, FL: The effects of whole-body random vibration on static and dynamic visual acuity with a video display; Prevalence of astigmatism among aviators and its limiting effect upon visual performance with the AN/PVS-5, Night Vision Goggles; Lateral spreading of visual adaptation; Computer model for evaluation of symbology contrast in the integrated helmet and display sighting system.							

DD FORM 1498

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 65 AND 1498-1 1 MAR 66 (FOR ARMY USE) ARE OBSOLETE.

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY					1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	3 REPORT CONTROL SYMBOL ^a
					DAOG0153	82 10 01	DD-DR&E(AR)636
4 DATE PREV SUMMARY ^a	5 KIND OF SUMMARY ^a	6 SUMMARY SCT ^a	7 WORK SECURITY ^a	8 REGRADING ^a	9A DISSEM INSTR ^a	9B SPECIFIC DATA CONTRACTOR ACCESS ^a	9C LEVEL OF SUM ^a
81 10 01	D. CHANGE	U	U		NL	<input type="checkbox"/> YES <input type="checkbox"/> NO	A. WORK UNIT
10 NO CODES ^a	PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER	WORK UNIT NUMBER			
A. PRIMARY	62777A	3E162777A879	BH	161			
B. CONTRIBUTING							
C. Contributing	STOG 80 7.2:4						
11 TITLE (Precede with Security Classification Code) ^a (U) Research Directed at Biomedical Parameters Affecting Aircrew Workload During Sustained Operations							
12 SCIENTIFIC AND TECHNOLOGICAL AREAS ^a							
013400 Psychology 001300 Aircraft 016200 Stress Physiology							
13 START DATE	14 ESTIMATED COMPLETION DATE	15 FUNDING AGENCY	16 PERFORMANCE METHOD				
78 10	CONT	DA	C. In-house				
17 CONTRACT GRANT				18 RESOURCES ESTIMATE	19 PROFESSIONAL MAN YRS	20 FUNDS (In thousands)	
A. DATES/EFFECTIVE				PRECEDING			
B. NUMBER ^a				FISCAL YEAR	82	1.6	271
C. TYPE				CURRENT	83	2.0	143
D. KIND OF AWARD				F. CUM. AMT.			
19 RESPONSIBLE DOD ORGANIZATION				20 PERFORMING ORGANIZATION			
NAME ^a US Army Aeromedical Research Laboratory				NAME ^a US Army Aeromedical Research Laboratory			
ADDRESS ^a Fort Rucker, AL 36362				Biomedical Applications Research Div			
				ADDRESS ^a Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)			
NAME: Price, D. R.				NAME ^a Stone, L.W.			
TELEPHONE: (205) 255-6917				TELEPHONE: (205) 255-3211			
21 GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
FIC				ASSOCIATE INVESTIGATORS			
				NAME: Simmons, R.R.			
				NAME:			
				POC: DA			
22 KEYWORDS (Precede EACH with Security Classification Code) (U) Man-machine Relations; (U) Military Aircraft (U) Psychology; (U) Aviation Medicine; (U) Stress; (U) Sustained Operations; (U) Human Volunteers							
23. (U) Little is known about the medical problems which extended operations have on helicopter aircrews. The objective of this project is to assess the biomedical parameters which affect aviation personnel during sustained military operations. The overall results of the research will provide a baseline criteria for: (a) physiologic measures of workload, stress and fatigue; (b) the effect of workload, stress, and fatigue on extended performance; (c) Army aviation personnel requirements for sustained operations; and (d) the fatigue and stress effects caused by special operational equipment such as night vision goggles or helmet-mounted sight systems.							
24. (U) The approach will involve the utilization of inflight and simulator monitoring and recording systems capable of sampling and recording continuous analog and digital information in experiments designed to measure pilot performance and aircraft response. These recording systems and statistical techniques will be utilized to quantify and predict aviator performance levels and subsequent man-system efficiency as a function of extended military operations.							
25. (U) 8110-8209. A concerted effort was mounted to recover the inflight data collected for the NVG/EMG study conducted in FY80/81. (The data was damaged by intermittent malfunction of the old inflight recording system.) The effort was successful for three maneuvers: hover, standard rate turns, and final approach (to landing). Analysis is planned for FY83. Part of the data from the simulator study was published as USAARI Technical Report 82-6, "Pursuit Rotor Tracking Performance in Conjunction with Extended Flight Operation in a Helicopter Simulator."							

DD FORM 1498
1 MAR 85

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE DD FORMS 1498A 1 NOV 85
AND 1498B 1 MAR 85 FOR ARMY USE ARE OBSOLETE

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	REPORT CONTROL SYMBOL DD-DR&E(AR)836	
3 DATE PREV SUMMARY	4 KIND OF SUMMARY	5 SUMMARY SCTY ^a	6 WORK SECURITY ^a	7 REGRADING ^a	8A DISSEM INSTR ^a	8B SPECIFIC DATA CONTRACTOR ACCESS ^a	9 LEVEL OF SUM ^a
81 10 01	D. CHANGE	U	U		NL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	A. VORS UNIT
10 NO. CODES ^a		PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER	WORK UNIT NUMBER		
a. PRIMARY		62777A	3E162777A879	BH	162		
b. CONTRIBUTING							
c. Contributing STOG 80 7.2:4							
11. TITLE (Precede with Security Classification Code) ^a							
(U) Visual Performance Research Related to Operational Problems in Army Aviation							
12. SCIENTIFIC AND TECHNOLOGICAL AREAS ^a							
012900 Physiology; 009400 Man-Machine Relations; 013400 Psychology; 001300 Aircraft							
13. START DATE		14. ESTIMATED COMPLETION DATE		15. FUNDING AGENCY		16. PERFORMANCE METHOD	
78 10		CONT		DA		C. In-House	
17. CONTRACT GRANT				18. RESOURCES ESTIMATE			
a. DATES/EFFECTIVE.				PRECEDING			
b. NUMBER ^a				FISCAL YEAR			
c. TYPE				CURRENT			
d. KIND OF AWARD				FUND (in thousands)			
e. CUM. AMT.				82 1.3 143			
				83 2.0 320			
19. RESPONSIBLE DOD ORGANIZATION				20. PERFORMING ORGANIZATION			
NAME: US Army Aeromedical Research Laboratory				NAME: US Army Aeromedical Research Laboratory			
ADDRESS: Fort Rucker, AL 36362				Biomedical Applications Research Div			
				ADDRESS: Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)			
NAME: Price, D. R.				NAME: Simmons, R. R.			
TELEPHONE: (205) 255-6917				TELEPHONE: (205) 255-6858			
				SOCIAL SECURITY ACCOUNT NUMBER			
21. GENERAL USE				ASSOCIATE INVESTIGATORS			
FIC				NAME: Kimball, K. A.			
				NAME: Stone, L. W. POC: DA			
22. KEYWORDS (Precede EACH with Security Classification Code) (U) Visual Performance; (U) Eye Movement; (U) Military Aircraft; (U) Man-Machine Relations; (U) Psychology; (U) Recording; (U) Human Volunteers							
23. (U) Visual perception to Army aircrews is critical for pilotage, navigation, and weapon utilization to fulfill various tactical requirements. The objective of this project is to provide US Army aviation information regarding the visual performance of fixed and rotary wing aviators during varying tactical missions. Special emphasis will be placed on the objective quantification and interpretation of these data and their relation to variables such as pilot physiological and psychological states and task loading.							
24. (U) The approach will involve the utilization of an oculomotor monitoring and recording device for visual data collection during flight. Areas of research to be addressed will include: aviator visual performance during conditions of VFR, IFR, night and nap-of-the-earth (NOE) flights; day and night navigation; scout helicopter operations, and varying aircraft comparisons. Measurements of dwell times, scan rates, fixations, and zones of workload will be analyzed to provide visual performance criteria and models. Additionally, data collection equipment and techniques are being designed to provide the ability to record visual data under night flight conditions and data analyses project.							
25. (U) 8110-8209. The joint research project relating to visual detection strategy directed by the US Coast Guard Research and Development Center in FY81 was completed, resulting in the publishing of USAARL Technical Report No. 82-7, Preliminary Study on Scanning Techniques Used by U.S. Coast Guard Lookouts During Search and Rescue Missions. A paper delineating the methodology used by USAARL in visual performance data collection via NAC Eye Mark Recorders will be submitted for publication within the first quarter of FY83. Analysis of pilot eye movement during increasing visual workload in an OH-58 has been completed and final report will be submitted for publication within the first quarter of FY83. Data reduction and analysis of pilot eye movement during low level terrain and NOE flight in a UH-1H is continuing and a report comparing performance on the basis of flight profile and experience level is forthcoming.							

DD FORM 1498

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 65 AND 1498-1 1 MAR 68 (FOR ARMY USE) ARE OBSOLETE.

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION ¹	2 DATE OF SUMMARY ²	REPORT CONTROL SYMBOL	
				PA006101	82 10 01	DD DR&E(AR)838	
3 DATE PREV SUMMARY	4 KIND OF SUMMARY	5 SUMMARY SCT ⁵	6 WORK SECURITY ⁶	7 REGRADING ⁷	8A DISSEM INSTR ^{8A}	8B SPECIFIC DATA CONTRACTOR ACCESS ^{8B}	9 LEVEL OF SUM ⁹
81 10 01	D. CHANGE	U	U		N1	<input type="checkbox"/> YES <input type="checkbox"/> NO	A WORK UNIT
10 NO CODES ¹⁰		PROGRAM ELEMENT		PROJECT NUMBER		TASK AREA NUMBER	
A. PRIMARY		62777A		3E162777A879		BH	
B. CONTRIBUTING						163	
C. COOPERATING		STOG 80 7.2.4					
11 TITLE (Precede with Security Classification Code) ¹¹							
(U) Parametric, Multimodal Workload Assessment in Aircraft Guidance Systems							
12 SCIENTIFIC AND TECHNOLOGICAL AREAS ¹²							
012900 Physiology; 009400 Man-machine Relations; 013400 Psychology; 001300 Aircraft							
13 START DATE		14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD	
80 10		84 12		DA		C. In-House	
17 CONTRACT GRANT				18 RESOURCES ESTIMATE		19 PROFESSIONAL MAN YRS	
A. DATES/EFFECTIVE				PREVIOUS		B. FUNDS (in thousands)	
B. NUMBER ¹⁷				FISCAL YEAR		82	
C. TYPE				CURRENT		83	
D. KIND OF AWARD				F. CUM. AMT.		2.4	
18 RESPONSIBLE DOD ORGANIZATION				19 PERFORMING ORGANIZATION			
NAME ¹⁸ US Army Aeromedical Research Laboratory				NAME ¹⁹ US Army Aeromedical Research Laboratory			
ADDRESS ¹⁸ Fort Rucker, AL 36362				ADDRESS ¹⁹ Biomedical Applications Research Div Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academy Institution)			
NAME Price, D. R.				NAME ²⁰ Hamilton, B.E.			
TELEPHONE (205) 255-6917				TELEPHONE (205) 255-6977			
21 GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
FIC				ASSOCIATE INVESTIGATORS			
				NAME:			
				POC: DA			
22 KEYWORDS (Precede EACH with Security Classification Code) ²²							
(U) Visual-Motor Performance; (U) Military Aircraft; (U) Workload; (U) Physiology; (U) Psychology; (U) Human Volunteers							
23. TECHNICAL OBJECTIVE ²³ 24. APPROACH, 25. PROGRAM (Furnish individual paragraphs identified by number. Precede first of each with Security Classification Code.)							
<p>23. (U) Sophisticated avionics, weapon systems, and taxing flight profiles place great demands upon aviator information processing abilities. The objective of this work unit is to provide measures of workload and cognition in order to critically assess the capabilities and limitations of aviators.</p> <p>24. (U) Tactical scenarios are analyzed to determine stressful and fatiguing components which adversely affect the aviator's mission accomplishments. Psychological and visual/psychomotor tests are identified or developed with the goal of being specifically tailored to the aviation scenario.</p> <p>25. (U) 8110-8209. To date, a computerized, field-portable psychological assessment battery has been used in two studies of the cognitive affects of wearing chemical defense ensembles in flight as well as collection of data during a four week aviation FTX. Two technical reports are in the process of USAARL HQ approval and analysis of the FTX data to be completed first quarter FY83. Work continues on validation of the total test system.</p>							

Available to contractors upon contractor's approval

DD FORM 1498

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 83 AND 1498B 1 MAR 88 FOR ARMY USE ARE OBSOLETE

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY					1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	REPORT CONTROL SYMBOL
					DAAG00151	82 10 01	DD DR&E (AR) 636
3 DATE PREV SUMMARY	4 KIND OF SUMMARY	5 SUMMARY SCTY ^a	6 WORK SECURITY ^a	7 REGRADING ^a	8A ORIGIN INSTN ^a	8B SPECIFIC DATA CONTRACTOR ACCESS ^a	9 LEVEL OF SUB A. WORK UNIT
81 10 01	D. CHANGE	U	U		NL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
10 NO. CODES ^a	PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER	WORK UNIT NUMBER			
A. PRIMARY	62771A	3E162777AS79	BH	103			
B. CONTRIBUTING							
C. 62771A STOG 80 7.2.4							
11. TITLE (Precede with Security Classification Code) ^a (U) Aeromedical Research of Operationally Significant Problems in the Army Aviation Environment							
12. SCIENTIFIC AND TECHNOLOGICAL AREAS ^a							
003500 Clinical Medicine; 012900 Physiology; 001300 Aircraft							
13. START DATE		14. ESTIMATED COMPLETION DATE		15. FUNDING AGENCY		16. PERFORMANCE METHOD	
78 10		CONT		DA		C. In-House	
17. CONTRACT GRANT				18. RESOURCES ESTIMATE			
A. DATES/EFFECTIVE		EXPIRATION		PRECEDING		A. PROFESSIONAL MAN YRS	
B. NUMBER ^a				FISCAL YEAR		B. FUNDS (In thousands)	
C. TYPE		D. AMOUNT		CURRENT			
E. KIND OF AWARD		F. CUM. AMT.					
19. RESPONSIBLE DOD ORGANIZATION				20. PERFORMING ORGANIZATION			
NAME ^a US Army Aeromedical Research Laboratory				NAME ^a US Army Aeromedical Research Laboratory			
ADDRESS ^a Fort Rucker, AL 36362				Biomedical Applications Research Div Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)			
NAME: PRICE, D. R.				NAME ^a KIMBALL, K. A.			
TELEPHONE: (205) 255-6917				TELEPHONE (205) 255-6861			
				SOCIAL SECURITY ACCOUNT NUMBER			
21. GENERAL USE				ASSOCIATE INVESTIGATORS			
FIC				NAME: SCHRIMSHER, R. H.			
				NAME: SIMMONS, R. R. POC: DA			
22. KEYWORDS (Precede EACH with Security Classification Code) ^a (U) Stress; (U) Biomedical Evaluation; (U) Aircraft; (U) Psychology; (U) Recording Devices; (U) Human Volunteers; (U) Aviation Medicine							
23. TECHNICAL OBJECTIVE, 24. APPROACH, 25. PROGRESS (Furnish individual paragraphs identified by number. Precede text of each with Security Classification Code.)							
<p>23. (U) The objective of this project is to provide a definitive assessment of medical problems peculiar to the aviation environment and prepare guidelines for field commanders on the impact of these problems on the aviation mission. The results of such research will aid in development of improved standards and biomedical techniques for the field flight surgeon to use in monitoring and treating aviator stress and fatigue as well as the medical standards for selection of aviators and air traffic controllers for specific assignments.</p> <p>24. (U) A multidisciplinary approach, utilizing physiological measuring techniques, flight surgeon assessments, as well as aircraft comparisons, will provide the method to analyze aviator performance in the operational environment. Parameters to be measured will include heart rate, respiration, biochemical stress indices, and inflight performance measurements.</p> <p>25. (U) 8110-8209. Results of the request from Health Services Command (HSC) to send a research team to four air ambulance units to evaluate and define hazards incurred by the units due to their unique military mission and environment have been presented to HSC. Results of the request from CG, USAAVNC, Fort Rucker, AL, to investigate attitudes of instructor pilots (IPs) concerning their workload, personal habits, off-duty habits, and other selected items of interest have been briefed to the CG, USAAVNC.</p>							

^a Available to contractors upon originator's approval

DD FORM 1498
1 MAR 68

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 65 AND 1498-1 1 MAR 68 (FOR ARMY USE) ARE OBSOLETE

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	3 REPORT CONTROL SYMBOL ^a	
				DAOG6102	82 10 01	DD-DR&E(AR)636	
4 DATE PREVIOUS SUMMARY	5 KIND OF SUMMARY	6 SUMMARY SECURITY	7 WORK SECURITY	8 REGRADING ^a	9A DISSEM INSTN ^a	9B SPECIFIC DATA CONTRACTOR ACCESS ^a	9C LEVEL OF SUB A WORK UNIT
81 10 01	D. CHANGE	U	U		NL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
10 NO. CODES ^a	PROGRAM ELEMENT	PROJECT NUMBER		TASK AREA NUMBER		WORK UNIT NUMBER	
A. PRIMARY	62777A	3E162777A879		BH		166	
B. CONTRIBUTING							
C. COOPERATING							
11 TITLE (Precede with Security Classification Code) ^a							
(U) Anthropometric Criteria for Army Aviators							
12 SCIENTIFIC AND TECHNOLOGICAL AREAS ^a							
009400 Man-Machine Relationships; 012900 Physiology; 001300 Aircraft							
13 START DATE		14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD	
80 11		84 02		DA		C. In-House	
17 CONTRACT GRANT				18 RESOURCES ESTIMATE		19 PROFESSIONAL MAN YRS	
A. DATES/EFFECTIVE				B. FISCAL YEAR		C. FUNDS (in thousands)	
B. NUMBER ^a				82		4.9	
C. TYPE				83		5.1	
D. KIND OF AWARD				83		284	
E. CUM. AMT							
19 RESPONSIBLE DOD ORGANIZATION				20 PERFORMING ORGANIZATION			
NAME ^a US Army Aeromedical Research Laboratory				NAME ^a US Army Aeromedical Research Lab			
ADDRESS ^a Fort Rucker, AL 36362				ADDRESS ^a Fort Rucker, AL 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. academic affiliation)			
NAME Price, D R				NAME ^a Schopper, A W			
TELEPHONE 205-255-6917				TELEPHONE 205-255-6896			
21 GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
				ASSOCIATE INVESTIGATORS			
				NAME Wells, J H			
				NAME			
				POC: DA			
22 KEYWORDS (Precede EACH with Security Classification Code) ^a							
(U) Anthropometrics; (U) Aircraft; (U) Strength;							
(U) Aviation Medicine; (U) Performance; (U) Human Volunteer							
23. TECHNICAL OBJECTIVE ^a 24. APPROACH. 25. PROGRAM (Furnish individual paragraphs identified by number. Precede text of each with Security Classification Code.)							
<p>23. (U) The increased concern about the use of women in the Army has resulted in the need to reevaluate the anthropometric criteria cited in AR 40-501 concerning Class 1, 1A, and 2 flying duty. Cockpit design criteria in MIL STD 1472B indicate that aircraft designers are to utilize the 5th-95th percentile male. Standards cited in AR 40-501 are not consistent with these guidelines, and previously conducted research has indicated that personnel smaller than the 5th percentile male are capable of flying some Army aircraft. Hence, a need exists to reevaluate and modify, as appropriate, extant anthropometric criteria.</p> <p>24. (U) Anthropometric data, including strength and weight measurements, will be obtained from males and females whose statures are less than 64 inches or greater than 73 inches. These data will be compared with the cockpit-related dimensions and individuals will be placed in aircraft to determine the anthropometric criteria. Weight criteria will be based on: crash-survivability considerations, aircraft weight and balance considerations, and medical obesity guidance. Strength criteria will be based on a consideration of both the maximum force required to fly selected Army aircraft and the evaluation of sustained physical exertion upon cognitive and psychosensory capabilities while performing multielement tracking tasks using aircraft controls which require varied levels of physical force input for their operation.</p> <p>25. (U) 8110-8209. Cockpit-referenced, seated-eye-height data from rated aviators were obtained for the Army's principal rotary wing aircraft. Equipment for the assessment of helicopter-control-referenced strength capabilities has been fabricated and subjected to preliminary tests. A set of variable force helicopter controls and an interactive microprocessor/graphics display have been obtained to assess the relationships among performance, strength and control forces.</p>							

DD FORM 1498

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 68 AND 1498-1 1 MAR 69 (FOR ARMY USE) ARE OBSOLETE.

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1. AGENCY ACCESSION		2. DATE OF SUMMARY		3. REPORT CONTROL SYMBOL	
				DAOG 8399		82 10 01		DD FORM 1498A	
4. DATE PREV SUMMARY	5. KIND OF SUMMARY	6. SUMMARY SCTY	7. WORK SECURITY	8. REGRADING	9. DISSEMINATION	10. SPECIFIC DATA CONTRACTOR ACCESS		11. LEVEL OF SUM	
82 03 01	D. CHANGE	U	U	NA	NI	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		A. WORK UNIT	
12. NO. CODES		PROGRAM ELEMENT		PROJECT NUMBER		TASK AREA NUMBER		WORK UNIT NUMBER	
A. PRIMARY		62734A		3M162734A875		AO		381	
B. CONTRIBUTING									
4. EOT/PT/PT/PT/PT/PT		STOG 80-7.2: 1							
11. TITLE (Precede with Security Classification Code)									
(U) Antidote and Antidote/Agent Effects on the Visual System									
12. SCIENTIFIC AND TECHNOLOGICAL AREAS									
012900 Physiology; 012600 Pharmacology; 016800 Toxicology									
13. START DATE			14. ESTIMATED COMPLETION DATE			15. FUNDING AGENCY		16. PERFORMANCE METHOD	
80 05			CONT			DA		C. IN-HOUSE	
17. CONTRACT GRANT									
A. DATES/EFFECTIVE			EXPIRATION			18. RESOURCES ESTIMATE		19. PROFESSIONAL MAN YRS	
B. NUMBER						PRECEDING		20. FUNDS (in thousands)	
C. TYPE			D. AMOUNT			FISCAL YEAR		21. FUNDS (in thousands)	
E. KIND OF AWARD			F. CUM. AMT.			CURRENT		22. FUNDS (in thousands)	
						83		2.7	
								401	
19. RESPONSIBLE DOD ORGANIZATION					20. PERFORMING ORGANIZATION				
NAME: US Army Aeromedical Research Laboratory					NAME: US Army Aeromedical Research Laboratory				
ADDRESS: Fort Rucker, AL 36362					ADDRESS: Ft Rucker, AL 36362				
RESPONSIBLE INDIVIDUAL					PRINCIPAL INVESTIGATOR (Punish SSAN if U.S. Academic Institution)				
NAME: Price, Dudley R.					NAME: Kirby, Albert W.				
TELEPHONE: (205) 255-6917					TELEPHONE: (205) 255-6815				
21. GENERAL USE					SOCIAL SECURITY ACCOUNT NUMBER				
Foreign Intelligence Considered					ASSOCIATE INVESTIGATORS				
					NAME: Wiley, R.W.				
					NAME: Harding, T.H. POC: DA				
22. KEYWORDS (Precede EACH with Security Classification Code) (U)Visual Physiology; (U)Visual Neuropharmacology; (U)Visual Anatomy; (U)Retina; (U)Nerve Agents; (U)Antidotes; (U)Autoradiography; (U)Animals									
23. TECHNICAL OBJECTIVE, 24. APPROACH, 25. PROGRAM (Punish individual paragraphs identified by number. Precede rest of each with Security Classification Code.)									
23. (U) The primary objective of this research program is to determine the effects of the administration of nerve agents and/or their antidotes on retina or higher visual mechanisms and/or processes. Transmission loss along the visual pathway due to the administration of these substances will be quantified and an assessment made of performance loss due to drug exposure. The sites of action and uptake of antidotes and agents within the visual system will also be studied.									
24. (U) The approach will include single and multiple neuron recording (gross potentials) techniques in anesthetized animals. By examining each area of interest before and after drug administration, drug related effects on overall visual function can be obtained. Autoradiography and other localization and histochemical techniques will be used to localize sites of action and uptake. Gross potential data will be compared to both anatomical findings and data obtained from single unit studies to provide an overall picture of visual system function following antidote/agent insult. Results from these studies will be used to infer actions on the impairment of the human visual system and the ability of the soldier to visually complete his mission.									
24. (U) 8110-8209. Development of additional instrumentation and software programs has continued and the protocol was completed. Experiments assessing the effect of the carbamate physostigmine and the organophosphate DFP on the cortical visual evoked potential were begun. Problems were encountered owing to the stability of physostigmine and DFP, and cholinesterase assays have been started to alleviate the problem.									

* Available to contractors upon originator's approval

DD FORM 1498
1 MAR 65

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DO FORMS 1498A 1 NOV 65 AND 1498-1 1 MAR 65 FOR ARMY USE ARE OBSOLETE

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY					1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	REPORT CONTROL SYMBOL	
					DAUC1506	82 10 01	DD DR&E (AR) 636	
3 DATE PREV SUMMARY	4 KIND OF SUMMARY	5 SUMMARY SCTY ^a	6 WORK SECURITY ^a	7 REGRADING ^a	8a DISSEM INSTR ^a	8b SPECIFIC DATA CONTRACTOR ACCESS <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		9 LEVEL OF SUP A. WORK UNIT
82 03 15	K. COMPL	U	U		NL			
10 NO. CODES ^a	PROGRAM ELEMENT	PROJECT NUMBER		TASK AREA NUMBER		WORK UNIT NUMBER		
A. PRIMARY	61101A	331011015910		00		277		
B. CONTRIBUTING								
C. CONTRIBUTING								
11 TITLE (Precede with Security Classification Code) ^a								
(U) Effects of Nerve-Agent Antidotes on the Visual System								
12 SCIENTIFIC AND TECHNOLOGICAL AREAS ^a								
012090 Physiology; 016010 Pharmacology; 016800 Toxicology								
13 START DATE		14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD		
81 1 3						C. In-house		
17 CONTRACT GRANT				18 RESOURCES ESTIMATE		19 PROFESSIONAL MAN YRS		20 FUNDS (In thousands)
A. DATES/EFFECTIVE		EXPIRATION		PRECEDENCE				
B. NUMBER ^a				FISCAL YEAR		CURRENCY		
C. TYPE		D. AMOUNT		82		1.5		27
E. KIND OF AWARD		F. CUM. AMT		83		0.0		0
19. RESPONSIBLE DOD ORGANIZATION				20. PERFORMING ORGANIZATION				
NAME ^a : US Army Aeromedical Research Laboratory				NAME ^a : US Army Aeromedical Research Laboratory				
ADDRESS ^a : Fort Rucker, AL 36362				ADDRESS ^a : Fort Rucker, AL 36362				
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)				
NAME: Price, D. R.				NAME ^a : Aplan, J. P.				
TELEPHONE: (205) 255-6917				TELEPHONE: (205) 255-6917				
21. GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER				
FIC				ASSOCIATE INVESTIGATORS				
				NAME:				
				NAME:				
22 KEYWORDS (Precede EACH with Security Classification Code)								
(U) Nerve Agents; (U) Antidotes; (U) Vision; (U) Animal Model; (U) Aplysia								
23. TECHNICAL OBJECTIVE, 24. APPROACH, 25. PROGRAM (Furnish individual paragraphs identified by number. Precede text of each with Security Classification Code.)								
<p>23. (U) To develop a method of screening nerve agent antidotes for effects on the visual system using the marine mollusc Aplysia as a relevant animal model. To determine the effects of antidotes directly on nerve cells at the various levels of the visual system, and on transmission of messages between the cells. To aid in development of antidote drug preparations which will not impair vision and thus compromise the ability of the soldier to accomplish his missions.</p> <p>24. (U) To study electrical responses of <u>in vitro</u> photoreceptor and visual-system cells to nerve-agent antidotes. Membrane potential, resistance, and current responses will be measured intracellularly in extra-retinal photoreceptor cells and then in cells at the various levels of the isolated eye-optic nerve-cerebral ganglion preparation. Effects of antidotes on discharge rates and transmission between cells will also be studied. The ionic basis of antidote action will be determined by chemical and pharmacological means.</p> <p>25. (U) 8103-8209. The organophosphate cholinesterase inhibitor, diisopropyl fluorophosphate (DFP) consistently caused a depolarization of the resting membrane potential of extraretinal photoreceptor cells. DFP also caused a consistent decrease in the photoresponse of these cells to nearly half of the control level. The effect of DFP increased with increasing doses of the drug. No consistent, significant effect of other drugs (physostigmine, atropine, curare, diazepam, or pralidoxime) on the photoresponse could be demonstrated. No protective effect of these drugs to prevent the DFP-induced diminution of photoresponse was observed. These results suggest a direct effect of DFP on the photoreceptor cell membrane. This project is planned for transition into core program efforts.</p>								

DD FORM 1498
1 MAR 60

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1496A 1 NOV 65 AND 1498 1 MAR 60 FOR ARMY USE ARE OBSOLETE.

RESEARCH AND TECHNOLOGY WORK UNIT SUMMARY				1 AGENCY ACCESSION ^a	2 DATE OF SUMMARY ^a	REPORT CONTROL SYMBOL	
				DACH 0151	82 10 11	DD FORM 1498A, 1 MAR 68	
3 DATE PREV SUMMARY	4 KIND OF SUMMARY	5 SUMMARY SEC ^a	6 WORK SECURITY ^a	7 REGRADING ^a	8A DISSEM INSTR ^a	8B SPECIFIC DATA CONTRACTOR ACCESS ^a	9 LEVEL OF SUM
82 03 15	1. CHANGE	U	U		NL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	A WORK UNIT
10 NO CODES ^a		PROGRAM ELEMENT	PROJECT NUMBER	TASK AREA NUMBER		WORK UNIT NUMBER	
A. PRIMARY		611-1A	3A161101A91C	00		292	
B. CONTRIBUTING							
C. CONTRIBUTING							
11 TITLE (Precede with Security Classification Code) ^a							
(U) Ultrastructural Survey of Retina and Optic Nerve in Vertebrates							
12 SCIENTIFIC AND TECHNOLOGICAL AREAS ^a							
002600 Biology; 012000 Physiology; 012500 Pharmacology							
13 START DATE		14 ESTIMATED COMPLETION DATE		15 FUNDING AGENCY		16 PERFORMANCE METHOD	
82 01		83 09		DA		C. In-house	
17 CONTRACT GRANT				18 RESOURCES ESTIMATE		A. PROFESSIONAL MAN YRS	
A. DATES/EFFECTIVE				PRECEDING		B. FUNDS (in thousands)	
B. NUMBER ^a				FISCAL YEAR		82	
C. TYPE				CURRENT		1.5	
D. KIND OF AWARD				83		0.5	
E. AMOUNT						40	
F. CUM. AMT							
19 RESPONSIBLE DOD ORGANIZATION				20 PERFORMING ORGANIZATION			
NAME ^a US Army Aeromedical Research Laboratory				NAME ^a US Army Aeromedical Research Laboratory			
ADDRESS ^a Fort Rucker, Alabama 36362				Sensory Research Division			
				ADDRESS ^a Fort Rucker, Alabama 36362			
RESPONSIBLE INDIVIDUAL				PRINCIPAL INVESTIGATOR (Furnish SSAN if U.S. Academic Institution)			
NAME: Price, L. L.				NAME ^a Fulbrook, J. E.			
TELEPHONE (205) 255-6917				TELEPHONE (205) 255-6811			
21 GENERAL USE				SOCIAL SECURITY ACCOUNT NUMBER			
FIC				ASSOCIATE INVESTIGATORS			
				NAME:			
				POC: DA			
22 KEYWORDS (Precede EACH with Security Classification Code)							
(U) Electron Microscopy; (U) Ultrastructural Survey; (U) Neuroanatomy; (U) Vision							
23 TECHNICAL OBJECTIVE ^a 24 APPROACH. 25 PROGRESS (Furnish individual paragraphs identified by number. Precede rest of each with Security Classification Code)							
<p>23. (U) To integrate ultrastructural neuroanatomy with ongoing research in neurophysiology and neuropharmacology of the vertebrate visual system. To make an ultrastructural survey at different neural levels and in specific cell types of the vertebrate visual system by using morphometric techniques to analyze the synaptology, connectivity, and overall morphology of the cell class(es) studied. To develop and employ techniques for specific localization of selected electron-dense, labeled compounds. By employing such techniques a more molecular level of appreciation will be gained in better understanding the structural, functional, and neurochemical organizations that yield the complex interactions that result in visual perceptions.</p> <p>24. (U) To study the ultrastructural organization of retinal inner plexiform layer cells using plastic-embedded ultrathin and thick sectioned tissue in an electron microscope. The structural organization of at least one retinal cell type will be studied using established morphometric techniques. The localization of putative neurotransmitters will be studied by employing selected electron-dense, labeled compounds in established histological protocols.</p> <p>25. (U) 8203-8209. All necessary materials to accomplish the proposed work have been placed on order to permit a start by October 1982. The primary investigator has just completed a visit to the National Eye Institute, NIH, to refamiliarize himself with the electron-dense and histological staining techniques to be employed in this work. The investigator also became familiar with the specific protocols for staining primate photoreceptors and post-receptor cells with Procion Yellow and Procion Black tissue - reactive stains for light and electron microscopy analysis.</p>							

DD FORM 1498
1 MAR 68

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE. DD FORMS 1498A 1 NOV 65 AND 1498 1 MAR 68 FOR ARMY USE ARE OBSOLETE.

Distribution

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Under Secretary of Defense for Research and Engineering ATTN: Military Assistant for Medical and Life Sciences Washington, DC 20301 (1)	Sixth United States Army ATTN: SMA Presidio of San Francisco, CA 94129 (1)
Uniformed Services University of the Health Sciences 4301 Jones Bridge Road Bethesda, MD 20014 (1)	Director Army Audiology & Speech Center Walter Reed Army Medical Center Forest Glen Section, Bldg 156 Washington, DC 20012 (1)
Commander US Army Medical Research and Development Command ATTN: SGRD-RMS/Ms Madigan Fort Detrick Frederick, MD 21701 (5)	Harry Diamond Laboratories Scientific & Technical Information Offices 2800 Powder Mill Road Adelphi, MD 20783 (1)
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